INSTRUCTION BOOK

RECEIVER, RADIO
UHF, CM-300 UR

WITH REMOTE CONTROL CAPABILITY

TYPE FA-18000 CM-300 UR

CONTRACT DTFA01-03-C-00035

CONTRACTOR
GENERAL DYNAMICS – DECISION SYSTEMS
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U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

April 7, 2004

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SECTION 1
GENERAL INFORMATION AND REQUIREMENTS

1.1 INTRODUCTION.- This section defines the purpose and scope of the Technical Instruction Book (TIB).

1.1.1 Purpose.- This TIB contains information necessary to install, test, operate, and maintain the General Dynamics Model CM-300 UR UHF Radio Receiver.

1.1.2 Scope.-

— Section 1, General Information and Requirements, provides a brief description of the receiver and describes the physical and functional characteristics.

— Section 2, Technical Description, provides simplified theory of operation supported by functional block diagrams.

— Section 3, Operation, describes the controls, indicators, and connectors and provides operating instructions.

— Section 4, Standards and Tolerances, provides pertinent equipment parameters, standard values, and tolerances.

— Section 5, Periodic Maintenance, provides a list of required maintenance and performance checks.

— Section 6, Maintenance Procedures, provides step-by-step procedures for the checks listed in Section 5.

— Section 7, Corrective Maintenance, provides warranty information and describes troubleshooting and removal/replacement procedures.

— Section 8, Parts List, provides a list of replaceable parts, their manufacturer, and part number.

— Section 9, Installation, Integration, and Checkout, provides procedures to install and integrate the receiver in a system and align and verify receiver operation.

— Section 10, Software, provides information on the installation and use of the Maintenance Data Terminal software (UHF MDT software).

— Appendix A, Second Level Engineering Support and Warranty Service Procedure, provides information on how to obtain second level engineering support and instructions for returning failed LRUs under warranty.

— Appendix B, Glossary of Terms, Acronyms and Abbreviations

— Appendix C, dBm Conversion Tables

1.1.3 Applicability.- This instruction book applies to the General Dynamics model CM-300 UR UHF Radio Receiver.

1.2 EQUIPMENT DESCRIPTION.- The General Dynamics model CM-300 UR UHF Radio Receiver is a UHF receiver providing line-of-sight AM reception of voice in the UHF frequency bands used in air traffic control operations. The receivers can be used with AM transmitters operating in the UHF frequency range of 225.000 to 399.975 MHz in 0.025 MHz tuning increments. They are designed for deployment in air-traffic control, fixed-station environments, and provide ground-to-air voice communications.

The receiver (Figure 1-1) is contained in a rack mount housing with operating controls, audio output phone jack, and RS232 interface for a local Maintenance Data Terminal (MDT) located on the front panel. The antenna connector, remote interface connector, AC and DC power connectors, and RS232 interface for a remote MDT device are located on the rear panel.

The receiver operating functions are microprocessor controlled. The operator can select the operating frequency, make adjustments, and monitor various receiver functions using a MDT device. The microprocessor monitors the MDT inputs, changes the configuration of the receiver accordingly, and displays configuration information on the MDT (Figure 1-2).

The MDT may be a laptop with Windows 2000 or Windows NT Service Pack 6.0 operating system with UHF MDT software.

Figure 1-1. CM-300 UR UHF Receiver
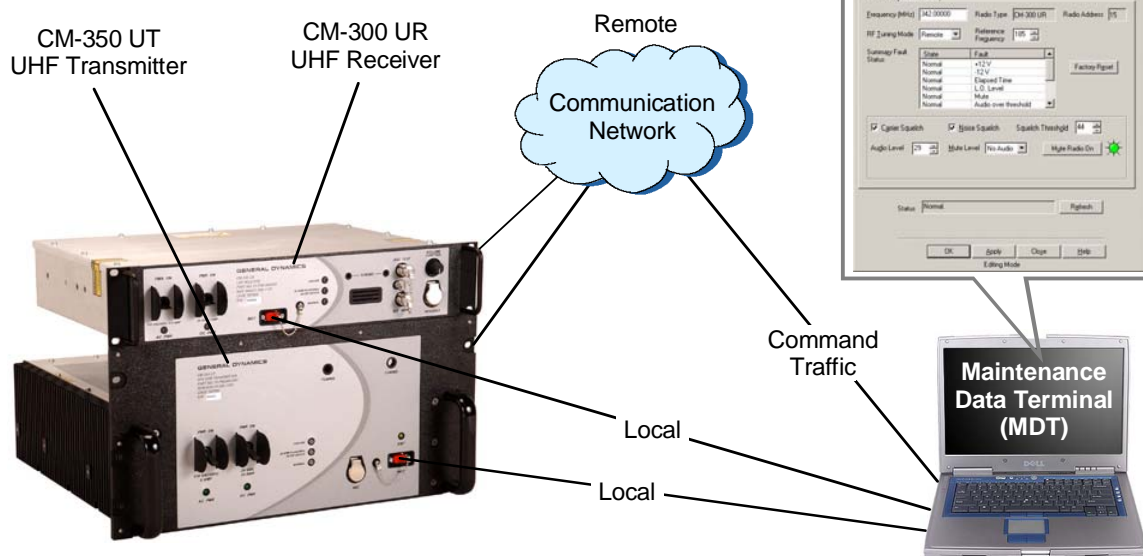
Figure 1-2. Typical System Arrangement With MDT

1.3 RELATIONSHIP OF RECEIVER TO SYSTEM.- The receiver can be connected to either an AC or DC power source, or both. The receiver is used in a system in conjunction with a UHF Transmitter operating in the 225.000 to 399.975 MHz frequency range.

The receiver and transmitter can be connected to a common antenna, or each radio can be connected to its own discrete antenna. When connected to a common antenna, transmit/receive switching is handled internally by the transmitter with an electronic Antenna Transfer Relay (ATR) switch. During normal operation, Air Traffic Control (ATC) personnel can transmit and receive through the system via the Remote Audio inputs and outputs. Local headset and microphone connections are provided for the use of support personnel.

An internal or external cavity filter may be used to manually tune each radio to the required frequency. Alternatively, the cavity filter may be bypassed and tuning is accomplished remotely using the MDT.

Paragraphs 1.3.1 through 1.3.3 describe the use of a common antenna, the use of cavity filters, and transceiver configurations. The abbreviations used in the Figures 1-3 through 1-5 mean the following:

ATR1   Connection to ATR connector 1 – NC (Normally Closed)
ATR2   Connection to ATR connector 2 – NO (Normally Open)
ATRC   Connection to the ATR common connector – To antenna
CF1   Input connection to the internal cavity filter
CF2   Output connection from the internal cavity filter

1.3.1 Using a Common Antenna.- Two UHF radio units may be connected to a common antenna with transmit/receive switching handled by the ATR. See Figure 1-3.

With Push To Talk (PTT) off, the ATR connects ATRC to ATR1, routing incoming signals from the antenna to the receiver. With PTT on, the ATR connects ATRC to ATR2 routing the transmit signal to the antenna. Thus two UHF radio units may be connected to a common antenna with transmit/receive switching handled by the ATR. See Figure 1-3.

1.3.2 Using a Cavity Filter .- The radios may be used either without a cavity filter, or with an internal cavity filter, or with an external cavity filter. The cavity filter configurations are accomplished through appropriate external connections using jumper cables. See Figure 1-4.

Using an internal (or external) cavity filter is referred to as the Fixed Tuning Mode. In this mode, the RF input signal is routed through the cavity filter for manual tuning.

Remote Tuning Mode does not utilize an internal (or external) cavity filter. In this mode, the RF input signal is routed through internal Voltage Tuned Filters (VTF) which are automatically tuned when the frequency is changed through the MDT.

1.3.3 Receiver Stand Alone Configurations.- Receiver Stand Alone configurations are shown in Figure 1-4. In the stand alone configuration the receiver can be set up in the fixed or remote tuning mode.

1.3.4 Transceiver Configurations .- Transceiver configurations, i.e., transmitter and receiver sharing an antenna, are shown in Figure 1-5. In the transceiver configuration, the receiver/transmitter can be set up in the fixed or remote tuning mode.

Push To Talk off
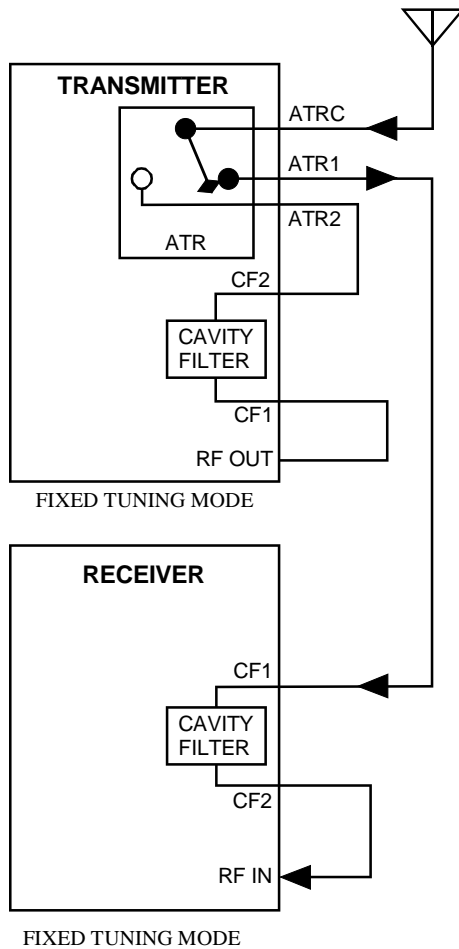
Push To Talk on
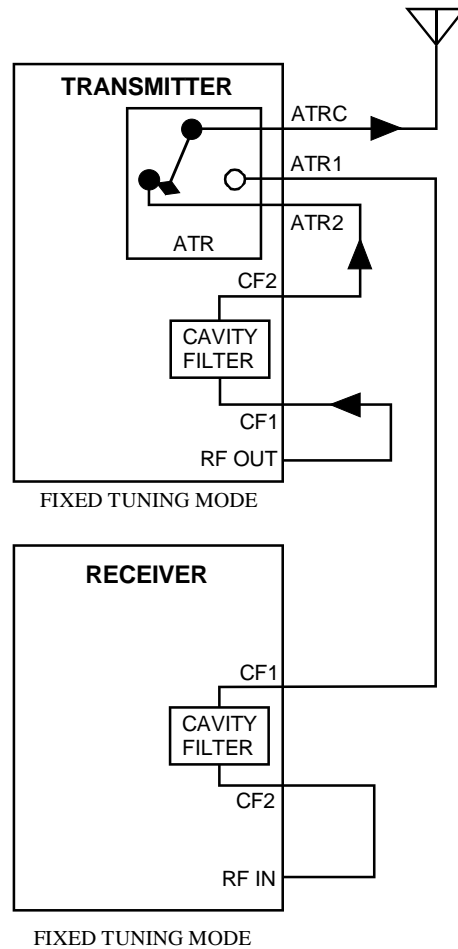
NOTE: TRANSMITTERS AND RECEIVERS MAY USE EITHER AN INTERNAL OR EXTERNAL
CAVITY FILTER

Figure 1-3. Transmit/Receive (Transceiver) Through Common Antenna
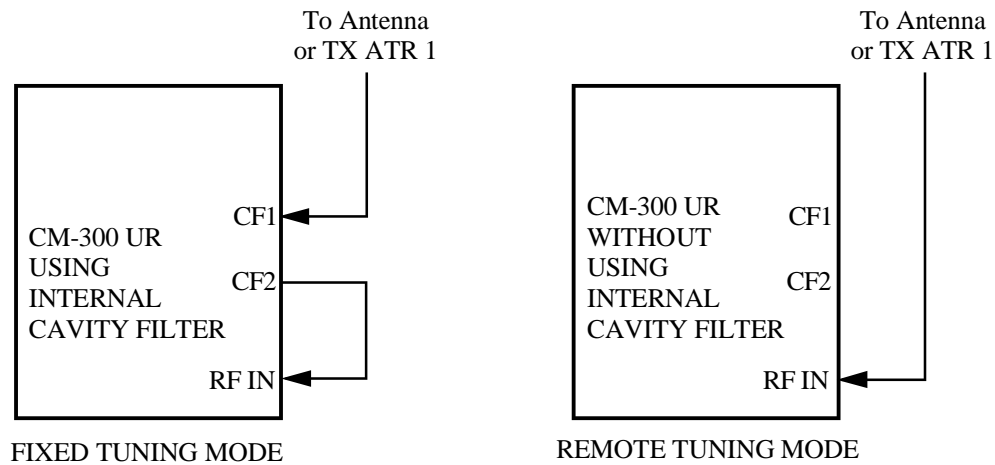
NOTE: AN EXTERNAL CAVITY FILTER MAY ALSO BE USED

Figure 1-4. CM-300 UR Stand Alone Configurations
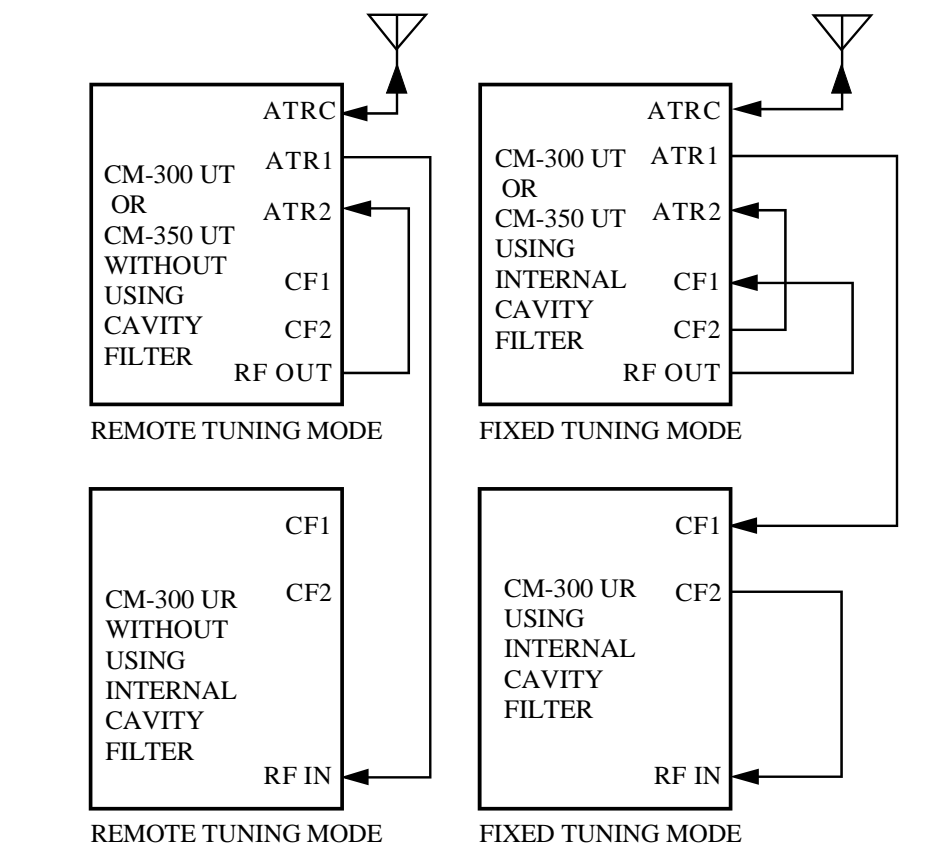
NOTE: AN EXTERNAL CAVITY FILTER MAY ALSO BE USED

**Figure 1-5. Transceiver Configurations,
CM-300 UT or CM-350 UT, and CM-300 UR**

1.3 EQUIPMENT SPECIFICATION DATA.- The operating parameters of the UHF receiver are listed in Table 1-1; the physical characteristics are listed in Table 1-2; and the environmental data in Table 1-3.

Table 1-1. Operating Parameters

Condition	Specification
Frequency Range	UHF - 225.000 to 399.975 MHz
Tuning Increments	0.025 MHz, 7,000 available channels
Frequency Stability	$<\pm 2$ ppm (for 1 year)
Modulation	AM
Primary Power	
AC Voltage	120 V ($\pm$ 10%), 60 Hz ($\pm$ 3Hz)
AC Current	0.5 Amps maximum
DC Voltage	+21 to +29 V DC
DC Current	1.0 Amps maximum
IF Selectivity	$\pm$ 9 kHz minimum, 6 dB down maximum
	$\pm$ 25 kHz maximum, 60 dB down minimum
Sensitivity (10 dB SINAD)	$\leq$ -102 dBm at any single frequency, 1 kHz modulation at 30%
Input Impedance	50 ohm nominal
Image Rejection	-70 dBc (typical)
Squelch	Two types; both adjustable:
	1) Carrier Squelch: -102 dBm to -65 dBm (RF Signal Level)
	2) Noise Squelch: 5 to 15 dB (Audio S/N)
Audio Response	$\pm$ 2 dB, 300 to 3000 Hz Down at least 20.0 dB at 10.0 kHz and above Down at least 10.0 dB at 100 Hz
Audio Output Level	> 100mW into 600 ohms (-25 dBm to +20 dBm)
Audio Output Source Impedance	600 ohms
Maximum RF Input into the Receiver	+13 dBm

Table 1-2. Physical Characteristics

Characteristic	Specification
Unpacked	
Height	3.5 inches
Width	19 inches (rack mount)
Depth	13 inches
Weight	14 pounds
Packed for Shipping	
Height	8 inches
Width	21 inches
Depth	17 inches
Weight	16 pounds
Volume	1.66 cu. ft.

Table 1-3. Environmental Data

Characteristic	Specification
Temperature (Operating)	-10°C to +50°C
Temperature (Storage)	-40°C to +70°C
Relative Humidity (Operating)	5 to 90%
Relative Humidity (Storage)	Up to 100%
Altitude (Operating)	15,000 feet, MSL (Mean Sea Level)
Altitude (Storage)	0-50,000 feet
Warm-up Time	Meets full specifications within 30 seconds after turn-on

1.4 EQUIPMENT AND ACCESSORIES SUPPLIED.- The equipment listed in Table 1-4 makes up the complete receiver package and is shipped as a unit.

Table 1-4. Equipment Supplied

Qty.	Item	Description	Manufacturer Part Number (NSN)
1	**CM-300 UR**	UHF Receiver	01-P40100G001 (5840-01-505-7137)
1	**Instruction Book**	Technical Instruction Book (TI6620.8)	68-P40108G (7610-01-511-7746)
1	**CM-300 UR KIT**	Contains the items below	67-P40160G001
1	**- Jumper Cable**	Jumper cable for connecting different cavity filter configurations and chaining to a common antenna.	30-P40236G001
1	**-AC Power Cable**		0EM-0299
1	**-DC Power Cable**		30-P30121P002
1	**-Slide Package**	Contains two pairs of slides and all necessary mounting hardware for mounting the slides to the rack mounting brackets and radio	CC7502-00-0110
1	**-Interface Connector Mating Receptacle Kit**	DB-15	
1	**Receptacle**		205205-2
15	Contact	Socket contact	66504-9
1	**Backshell**		207908-4
1	-**MDT Connector Mating Plug Kit**	DB-9	
2	**Plug**		205204-3
18	**Contact**	Pin contact	66506-9
2	**Backshell**		207908-1

1.5 EQUIPMENT REQUIRED BUT NOT SUPPLIED.- The equipment listed in Table 1-5 is needed for installation, maintenance and other functions described in subsequent sections. These items are not supplied with the receiver.

Table 1-5. Equipment Required But Not Supplied

Qty.	Item	Manufacturer	Part Number	NSN
1	Digital Multimeter	Fluke	8100, or equivalent	
1	Audio Analyzer	Agilent	8903E, or equivalent	
1	Signal Generator	Agilent	E4434B, or equivalent	
1	Frequency Counter	Hewlett Packard	5384A, or equivalent	
1	Oscilloscope	Tektronix	465, or equivalent	
1	600 ohm Headset	Northern Telecom	NT49985A, or equivalent	
1	Crimping Tool	AMP	58448-2, or equivalent	5120-01-361-8970
4	Rack Mounting Brackets	Jonathan Engineering Solutions	SPO-551, or equivalent	5340-01-242-5172
1	MDT Terminal	Commercial	Laptop PC with Windows 2000 or Windows NT Service Pack 6.0, or equivalent	
1	UHF MDT Software	General Dynamics	99-P40681G	7025-01-505-7164
1	Screwdriver	Xcelite	R3323, or equivalent	

SECTION 2
TECHNICAL DESCRIPTION

2.1 INTRODUCTION.- This section describes the theory of operation of the CM-300 UR UHF receiver. Paragraph 2.2 covers the simplified theory of operation as it pertains to the simplified block diagram shown in Figure 2-1 and the detailed block diagram shown in Figure 2-2.

2.2 SIMPLIFIED THEORY OF OPERATION.- The receiver is broken into functional blocks of circuitry, and the theory of operation of each block is described separately.
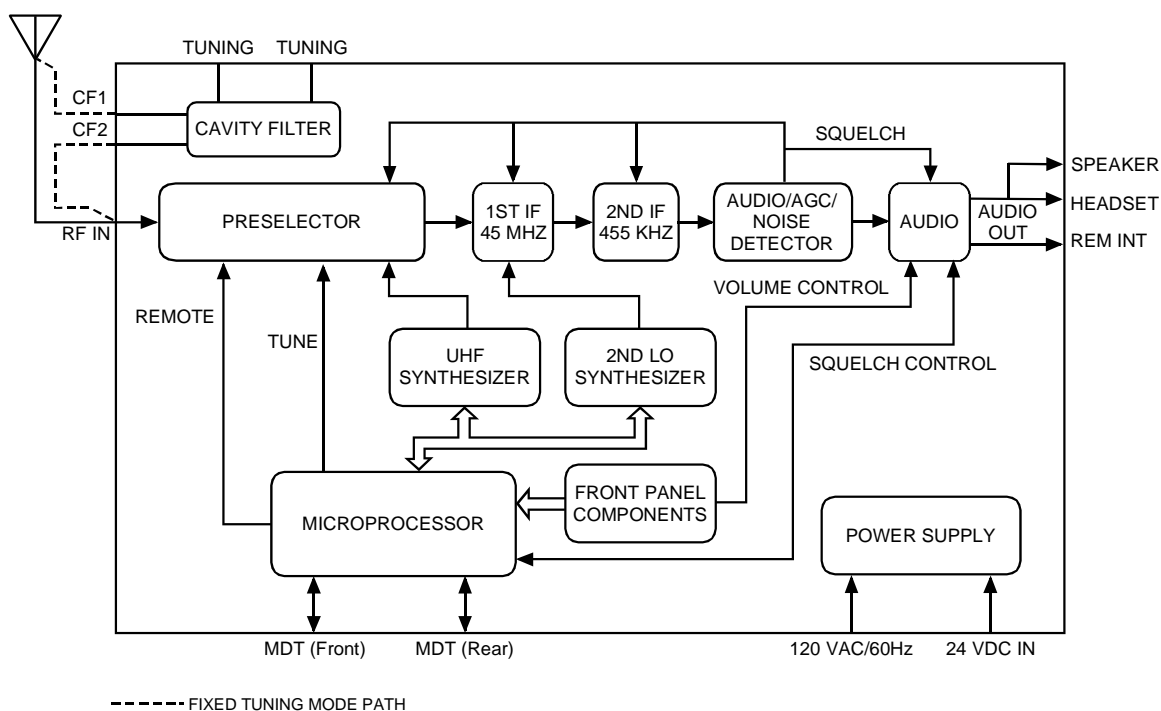
Figure 2-1. CM-300 UR Receiver Simplified Block Diagram

2.2.1 Fixed/Remote Operation.- Fixed tuning mode or remote tuning mode is selectable at the Maintenance Data Terminal (MDT). In the fixed mode, the RF input signal is routed through the cavity filter for manual tuning. In the remote mode, the cavity filter is not used and the RF input signal is routed through the Voltage Tuned Filters (VTF) which are automatically tuned when the frequency is changed through the MDT (see Section 1.3.2). In either mode, the receiver is tunable from 225.000 to 399.975 MHz.

2.2.2 Cavity Filter.- The cavity filter rejects frequencies outside approximately a 500 kHz passband.

2.2.3 Preselector.- The preselector provides additional filtering and amplification of the signal. The signal passes through a PIN-diode Voltage Controlled Attenuator (VCA). The attenuator reduces the amplitude of very large input signals to prevent overdriving the RF amplifier. The signal is then applied to a fixed gain, low-noise, broadband RF amplifier with a gain of 13 dB. After amplification, it is passed through a second VTF whose function is to provide additional rejection of undesired frequencies including the image frequency. Finally, the signal is converted in the first mixer to 45 MHz and applied to the First IF stage. The Local Oscillator (LO) signal to the mixer is provided by the UHF synthesizer.

2.2.4 First IF.- The First IF stage receives the 45 MHz signal from the Preselector. This stage provides filtering and amplification. The signal from the mixer is passed through the first of a pair of identical crystal bandpass filters that provide off-channel rejection and contribute to the overall IF selectivity of the receiver. The signal is then amplified by fixed gain IF amplifiers, whose overall gain is approximately 14 dB, and passed through the second of the crystal filters.

After additional filtering, the signal is applied to an Automatic Gain Control (AGC) IF amplifier. The gain of this amplifier varies according to the AGC voltage which is a function of received signal strength. The greater the level of received signal, the less amplification the AGC controlled amplifiers provide. Lastly, the Second mixer converts the signal to the Second IF of 455 kHz before applying it to the Second IF stage. The Second LO synthesizer provides the LO signal to the Second IF mixer.

2.2.5 Second IF.- The Second IF stage provides additional filtering and AGC controlled amplification of the signal. The signal is bandpass filtered by a ceramic filter which provides additional off-channel rejection. The combined response of this filter and the crystal filters in the first IF stage produce the overall receiver IF selectivity. The signal is then amplified by AGC controlled amplifiers to boost the level of the signal to the Detector/AGC circuit. As in the first IF stage, the gain of the AGC controlled amplifiers varies according to the AGC voltage. The greater the level of received signal, the less amplification the AGC controlled amplifiers provide which keeps the signal into the Detector/AGC circuit at a constant level.

2.2.6 Audio/AGC Detector.- The Detector stage strips the audio modulation from the IF signal and applies it to the audio circuits, detects the amplitude of the received signal and uses it to develop the AGC voltage, and detects the level of received noise for use in the carrier-to-noise squelch.

The Diode Detector strips the modulation and noise from the 455 kHz IF signal and converts the 455 kHz carrier level to a DC voltage. The signal at the output of the detector consists of audio (and band limited noise) limited to the ±9 kHz bandwidth of the IF filters. The detected audio/noise passes to the Audio stage (discussed later) and to the AGC loop filter which filters off the audio and noise from the DC level voltage.

The AGC loop filter maintains a constant DC level by adjusting the AGC voltage (which represents the received signal strength). Several discrete buffers level-shift and distribute the AGC voltage to the RF and IF AGC stages to control the receiver gain. The AGC voltage also provides the DC level input to the squelch gate control.

The Noise Holdoff circuit detects the level of noise in the detector output. Two stages of high pass filters reject the energy below 6 kHz which contains the audio modulation. A second detector, following the high pass filters, then detects only the level of noise energy in the received signal. The detector output, a voltage proportional to the noise level, is converted to a current. This current is subtracted from the current generated in the squelch buffer in the AGC circuit, which is proportional to the AGC voltage.

The squelch gate comparator uses the resulting current to control the squelch gate. Under no signal conditions, the high noise level means a large amount of current is subtracted, which reduces the effective carrier level applied to the squelch gate comparator and the receiver remains squelched. As the signal strength to the receiver increases, the AGC level increases and the noise level decreases. Less current is subtracted, and the effective carrier level applied to the squelch gate increases. When the level exceeds the squelch threshold set by the MDT input, the receiver squelch opens.

If a signal is applied to the receiver which contains high levels of inband noise, even though the AGC level rises with signal strength, the noise detector output does not decrease and the receiver remains squelched. However, the maximum detected noise level is fixed, and the AGC level for a sufficiently strong signal will override the noise holdoff. The interaction between the AGC circuit, which measures signal level, and the noise detector circuit, which measures noise level, produces a carrier to noise squelch.

2.2.7 Audio.- The audio circuits filter and amplify the detected audio signal and route the processed audio to the remote audio output on the rear panel and to the headset and speaker outputs on the front panel. The audio circuits provide audio output level control and squelch. Audio leveling provided by the Audio AGC, separate from the IF AGC, reduces the variation in audio level resulting from variations in modulation percentage on the received signal.

The Audio Filter/AGC circuit first low pass filters the detected audio signal to reduce unwanted noise above 3.5 kHz. The low passed audio then passes through a gain controlled amplifier followed by a high pass filter, which reduces noise below 300 Hz. A detector rectifies the filtered audio. The loop filter removes the audio components from the detected audio and applies the resulting DC to the error amplifier. The amplified error voltage drives the Audio Gain Controlled Amplifier to level the audio signal applied to the volume control potentiometers.

Independent audio amplifiers amplify the output of the volume control potentiometers and apply the amplified signals to the remote audio outputs, headset, and speaker. The audio amplifiers provide transformer coupled, balanced 600 ohm outputs. The audio amplifiers incorporate a built-in squelch gate (Inhibit Input) controlled by the squelch comparator. When the RF AGC-Noise signal exceeds the Squelch setting, the squelch comparator outputs a logic low to the Audio Amplifier Inhibit Input enabling audio to the remote, headset, and speaker outputs.

2.2.8 UHF Synthesizer.- The UHF Phase-Locked-Loop (PLL) Synthesizer, with a frequency range of 270 MHz to 444.975 MHz, generates the LO signal input to the first IF mixer. The synthesizer frequency is always the operating frequency (F_O) plus the IF of 45 MHz.

The Controller supplies the data to select the proper frequency based upon the operator selected frequency which can be adjusted in 25 kHz steps. A 16.8 MHz reference oscillator provides the synthesizer integrated circuit (PLL IC) with a frequency reference that it divides internally to produce the appropriate loop reference frequency. A sample of the RF output from the Voltage Controlled Oscillator (VCO) is buffered and fed back to the synthesizer IC. This signal passes through the synthesizer pre-scalar, internal to the chip, and is divided to match the frequency of the loop reference signal. Both signals are applied to the internal phase comparator which compares the phase of signals.

Any difference in phase between the signals is translated into a DC error current. The DC error current is filtered and scaled to produce a tuning voltage to the VCO, which corrects any error in the frequency of oscillation. Together, the synthesizer IC, loop filter, and VCO form a phase-locked loop that generates RF signals with a frequency accuracy of better than 2 parts per million ($<\pm2$ Hz for every MHz). The UHF synthesizer output is buffered by a balanced, fixed gain amplifier that provides an output power level of 100 mW to drive the LO input to the first IF mixer.

When the loop is locked at the proper frequency, the synthesizer provides a lock detect signal to the microprocessor indicating that the synthesizer is locked on frequency. The reference oscillator also supplies 16.8 MHz through buffer amplifiers to the second LO synthesizer to be used as a reference and to REF MON, the 16.8 MHz frequency reference test connector on the front panel.

2.2.9 Second LO Synthesizer.- The 2nd LO Phase-Locked-Loop synthesizer operates at a fixed 44.545 MHz. The 2nd LO synthesizer output drives the second IF mixer LO port. The Synthesizer shares the same reference frequency as the UHF synthesizer, and operates in a manner similar to the UHF Synthesizer. The reference frequency and the VCO frequency are divided internal to the synthesizer IC and compared by a phase comparator. Any difference in phase between the signals is translated into a DC error current, which is filtered and scaled to produce a tuning voltage to correct the VCO frequency.

2.2.10 Microprocessor.- The main component of the controller is the microprocessor. The microprocessor controls all receiver functions based on user inputs. User inputs are entered through the use of a Maintenance Data Terminal (MDT) connected to the local

(front panel) or remote (rear panel) MDT connector. The microprocessor programs the receiver frequency, and monitors receiver power supplies and other operations.

The microprocessor provides tuning data through a serial interface to the UHF synthesizer, the 2nd LO synthesizer, and to the D/A converter which tunes the preselector filter. The microprocessor monitors the UHF and 2nd LO synthesizer lock indicators via LK_DET_1 and LK_DET_2. The microprocessor provides a SYNTH LOCK error message to the MDT if either of these signals indicate an out of lock condition.

The microprocessor chip has a built-in, 16 input multiplexed, 10 bit A/D converter. Twelve internal voltages are monitored by the microprocessor. Two may be used during factory test and for Remote Maintenance Monitoring (RMM).

2.2.11 Front Panel Components.- The Front panel components consist primarily of the AC/DC power switches, failure, and alarm/alert indicators, speaker, headset connector, audio volume control, the MDT local connector, and cavity filter tuning adjustment controls.

The power switches control the application of AC and DC voltage, input from the rear panel, to the power supply circuits. The FAILURE and ALARM/ALERT indicators indicate the operational status of the receiver. The Speaker and HEADSET provide audio outputs and the audio VOLUME CONTROL is an operator adjustable potentiometer which adjusts headset and speaker audio level. The speaker output is disabled when the headset is connected. The TUNING controls facilitate the tuning of the cavity filter for optimum response at the receiver operating frequency. The MDT connector provides the user interface with the microprocessor. The MDT controls the functions of the microprocessor and provides the feedback from the microprocessor to the user. See Section 3 for detailed description of controls and indicators.

2.2.12 Power Supply.- The Power supply converts the primary 120 VAC or 24 VDC input to ±12 VDC, ±5 VDC. The receiver operates on 120 VAC and automatically switches to +24 VDC if the AC line voltage sags or is lost. Both the AC and DC inputs are EMI filtered at the rear panel where they enter the radio. The DC input is also protected against reverse polarity via a series diode. Both AC and DC inputs are fuse protected.

The Voltage Converter consists of an AC and DC portion. The 120 VAC is converted to 28 VDC to be compatible with the + 24 VDC input requirements. Then the DC-to-DC converter is driven by either the direct 24 VDC input or the converted 28 VDC from the AC converter section. The outputs from the DC-to-DC converter provide +12 and -12 VDC and series regulators provide DC voltages of +19 VDC, +5 VDC, and -5 VDC.

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General Dynamics Decision Systems CM-300 UR
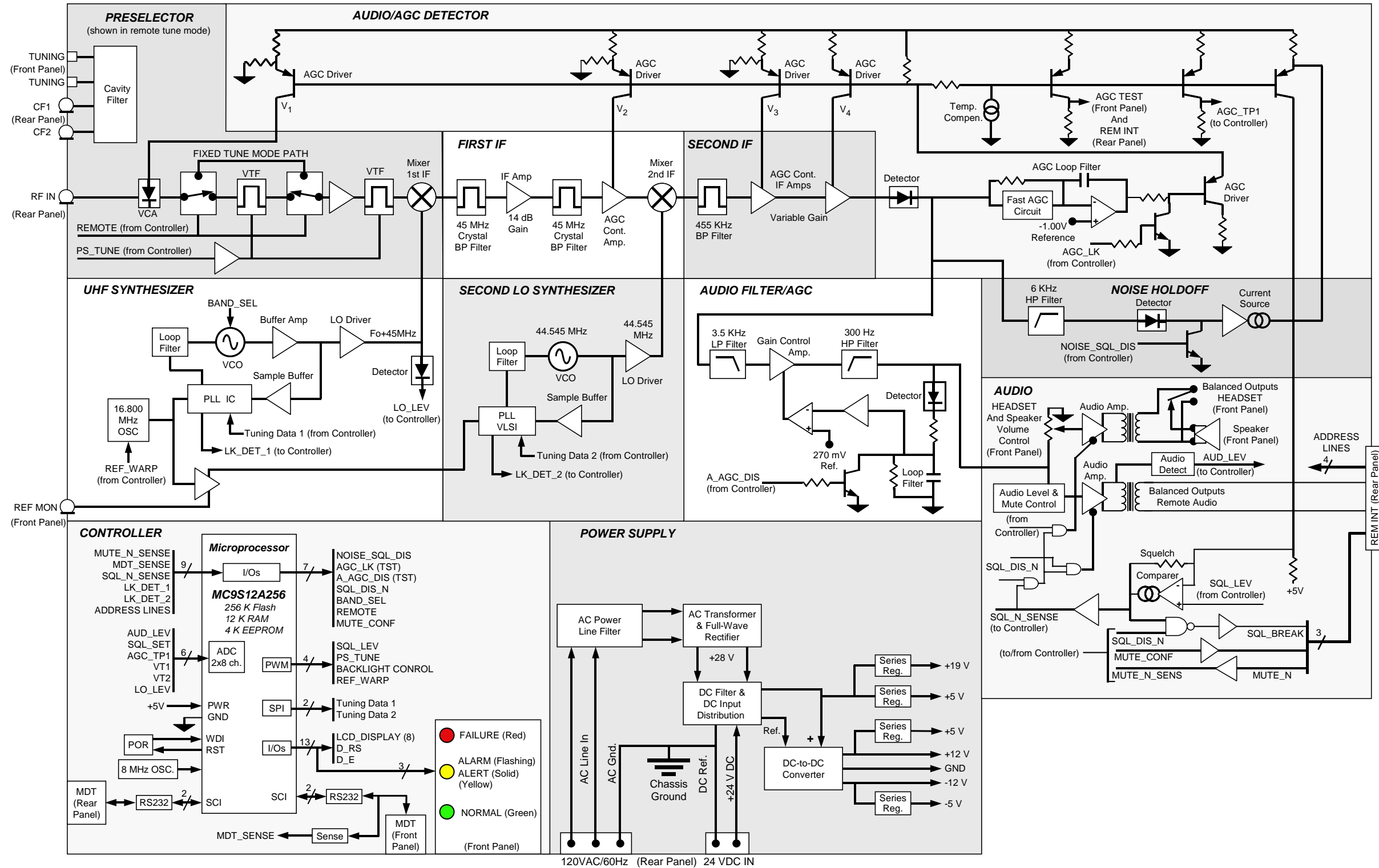
Figure 2-2. CM-300 UR Receiver Detailed Block Diagram

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SECTION 3
OPERATION

3.1 INTRODUCTION.- The following paragraphs provide information for operating the General Dynamics model CM-300 UR UHF Radio Receiver. Included are

- Descriptions of all controls, indicators, and connectors.

- Connector interface pin outs.

- Operational description of the front panel status indicators (NORMAL, FAILURE, ALARM/ALERT), HEADSET, and Speaker.

- MDT operation.

- Receiver start-up and operation.

- Equipment shutdown.

- Emergency operation.

3.2 CONToROLS, INDICATORS, AND CONNECTORS.– This section describes all controls, indicators, and connectors.

3.2.1 Front Panel Controls, Indicators, and Connectors.- The front panel controls, indicators, and connectors are shown in Figures 3-1 and described in Table 3-1.
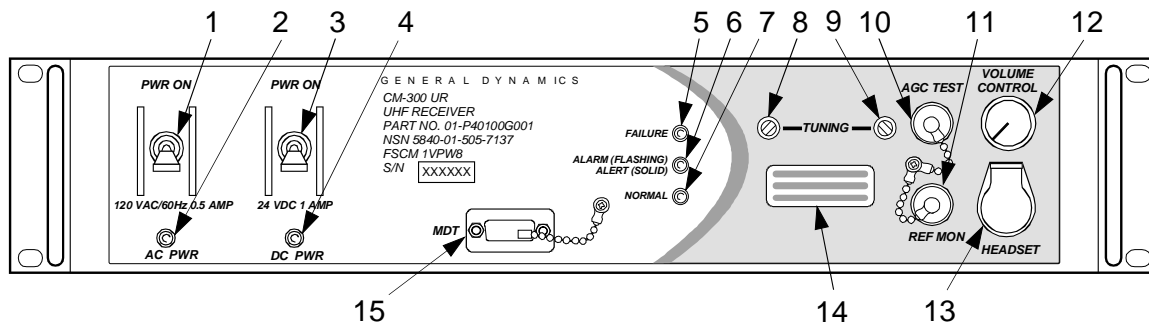
Figure 3-1. CM-300 UR Front Panel Controls, Indicators, and Connectors

Table 3-1. CM-300 UR Front Panel Controls, Indicators, and Connectors

Index No.	Controls, Indicators, Connectors	Type	Function
1	PWR ON 120 VAC/60Hz 0.5 AMP	Switch	Switches ON or OFF the 120 VAC power source.
2	AC PWR	Green LED Indicator	Lit when AC power is applied to the receiver.
3	PWR ON 24 VDC 1 AMP	Switch	Switches ON or OFF the 24 VDC power source.
4	DC PWR	Green LED Indicator	Lit when DC power is applied to the receiver.
5	FAILURE	Red LED Indicator	Indicates 3 types of Failures. See Table 3-8.
6	ALARM (FLASHING) ALERT (SOLID)	Yellow LED Indicator	Indicates 2 types of Alarms. See Table 3-9. Indicates 4 types of Alerts. See Table 3-9.
7	NORMAL	Green LED Indicator	Lit when the receiver is operating correctly.
8	TUNING (left)	Rotary slotted adjustment	Adjusts the cavity filter for optimum response at the receiver operating frequency.
9	TUNING (right)	Rotary slotted adjustment	Adjusts the cavity filter for optimum response at the receiver operating frequency.
10	AGC TEST	BNC Type Connector	Provides operator front panel access to the AGC voltage for test.
11	REF MON	BNC Type Connector	Used to monitor the frequency of the internal Reference Oscillator Reference Frequency during frequency stability tests and adjustments.
12	VOLUME CONTROL	Rotary control knob	Continuously variable potentiometer adjusts headset and speaker audio level.
13	HEADSET	Phone Jack	Connection for 600-ohm headset to locally monitor receive audio.
14	SPEAKER	Speaker	Provides audio output (when Headset is not plugged in).
15	MDT	DB-9	RS232 interface to local MDT device.

3.2.2 Rear Panel Connectors.- The CM-300 UR rear panel connectors are shown in Figures 3-2 and explained in Table 3-2.
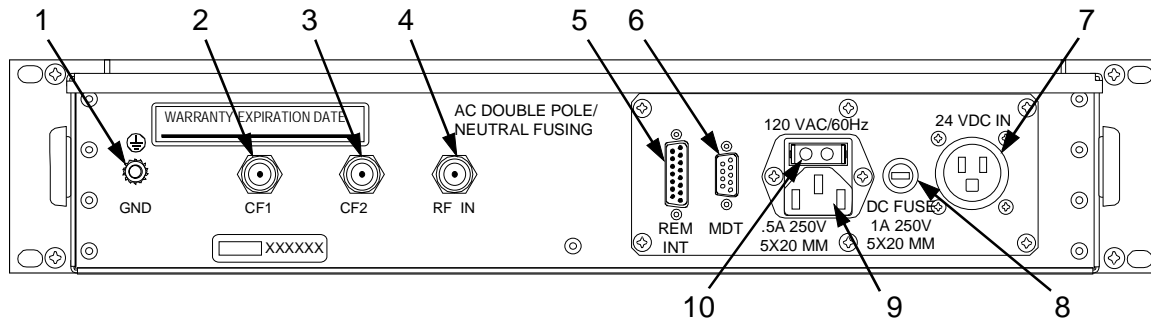
Figure 3-2. CM-300 UR Rear Panel Connectors

Table 3-2. CM-300 UR Rear Panel Connectors

Index No.	Connectors	Type	Function
1	GND	Threaded Post	Provides a ground connection to the receiver chassis.
2	CF1	Type N Connector	Input connection to the internal cavity filter.
3	CF2	Type N Connector	Output connection from the internal cavity filter.
4	RF IN	Type N Connector	Input connector to UHF receiver.
5	REM INT	DB-15	Connection for remote interface. See Section 3.2.3.1.
6	MDT	DB-9	RS232 interface to remote MDT device.
7	24 VDC IN	3 prong-2 conductor DC power connector	Connects receiver to 24 VDC source (pin 3 not connected).
8	DC FUSE 1A 250V 5X20 MM	Cartridge fuse	Circuit protection for 24 VDC.
9	120 VAC/60 Hz	3 conductor AC power connector	Connects receiver to 120 VAC/60 Hz source.
10	AC DOUBLE POLE/NEUTRAL FUSING 0.5A 250V 5X20 MM	Cartridge fuse	Provides overcurrent protection on 120 VAC line.

3.2.3 Connector Interface Pin Outs.- Tables 3-3 through 3-7 list the signal connections for the REM INT, MDT, 120 VAC/60 Hz, 24 VDC IN, and HEADSET connectors.

3.2.3.1 REM INT Connector Pin Outs.- The REM INT connector of the radio is a 15-pin plug type connector (Figure 3-3). See Table 3-3 for REM INT connector pin assignments.
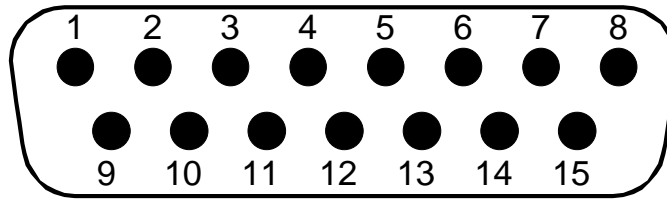
Figure 3-3. REM INT Connector, Pin Location

Table 3-3. REM INT Connector, Pin Assignments

Pin Number	Signal Name	Description
1	ADDR_0	Address bit 0 for setting the radio unit number.
2	ADDR_1	Address bit 1 for setting the radio unit number.
3	GND	Ground.
4	SQ_BREAK	Squelch Break (output). The radio provides a signal that notifies the remote operator of the radio squelch status: Short Circuit = Active (1 amp max) Open Circuit = Not Active (< 80 VDC max)
5	N/C	No Connection.
6	GND	Ground
7	REM_AUD	Voice Audio (output). The remote user monitors the radio audio via the radio's remote audio output from a balanced 600-ohm transformer. Signal level as per setting of the receiver.
8	REM_AUD _RTN	Voice Audio Return.
9	ADDR_2	Address bit 2 for setting the radio unit number.
10	ADDR_3	Address bit 3 for setting the radio unit number.
11	MUTE_N	Receiver Mute Control (input). The remote operator can mute the radio: Ground = Mute (0 VDC ± 1 V) Open = No Mute (0.5 mA <40 VDC)
12	GND	Ground
13	MUTE_CONF_N	Receiver Mute Confirmation (output). The radio provides a response to the remote user to confirm mute status: Short Circuit = Confirm 1 amp max Open Circuit = No Confirm < 80 VDC max
14	N/C	No Connection.
15	N/C	No Connection.

3.2.3.2 MDT Connector Pin Outs.- The MDT connector of the radio is a 9-socket receptacle type connector (Figure 3-4). Table 3-4 describes the socket assignments for the MDT connector.
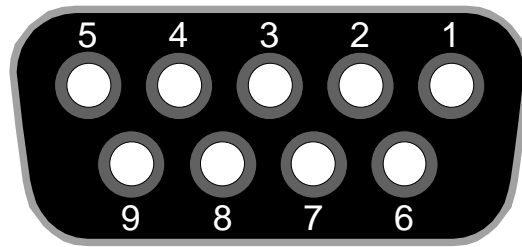
Figure 3-4. MDT Connector, Socket Location

Table 3-4. MDT Connectors, Socket Assignments

Socket Number	Front		Rear	
	Signal Name	**Description**	**Signal Name**	**Description**
1	N/C	No Connection.	N/C	No Connection.
2	FR_TXD	Transmit Data from radio.	BACK_TXD	Transmit Data from radio.
3	FR_RXD	Receive Data to radio.	BACK_RXD	Receive Data to radio.
4	MDT_SENSE	Senses front (local) MDT connection and disables the rear (remote) MDT.	N/C	No Connection.
5	Ground	Ground	Ground	Ground
6	N/C	No Connection.	N/C	No Connection.
7	N/C	No Connection.	N/C	No Connection.
8	N/C	No Connection.	N/C	No Connection.
9	N/C	No Connection.	N/C	No Connection.

3.2.3.3 120 VAC/60 Hz Connector Pin Outs.- The pin assignments of the 120 VAC/60 Hz
Connector (Figure 3-5) are described in Table 3-5.
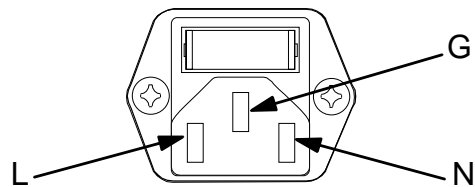
Figure 3-5. 120 VAC/60 Hz Connector, Pin Location

Table 3-5. 120 VAC/60 Hz Connector, Pin Assignments

Pin Number	Signal
G	AC Ground.
N	AC Neutral.
L	AC Line.

3.2.3.4 24 VDC IN Connector Pin Outs.- Table 3-6 describes the pin assignments for the 24
VDC IN Connector.

Table 3-6. 24 VDC IN Connector, Pin Assignments

Pin Number	Signal
1	+24 VDC Input.
2	Ground
3	Not connected.

3.2.3.5 HEADSET Connector Pin Outs.- Table 3-6 describes the pin assignments for the
HEADSET Connector.

Table 3-7. HEADSET Connector, Pin Assignments

Pin Number	Signal
1 (Ring)	Headset Audio Output.
2 (Sleeve)	Headset Audio Return.

3.3 OPERATION OF FRONT PANEL INDICATORS, HEADSET, AND SPEAKER .- This paragraph describes the operation of the NORMAL indicator, FAILURE indicator, ALARM /ALERT indicator, HEADSET, and Speaker.

The significance of a NORMAL, ALERT, ALARM, or FAILURE condition is as follows:

NORMAL -   Normal condition, receiver operational.

ALERT -   Some performance parameters degraded, receiver still operational.

ALARM -   Performance severely degraded, receiver operational status questionable.

FAILURE -   Receiver not operational, requires immediate attention.

3.3.1 NORMAL Indicator.- The NORMAL indicator is a green LED and, when lit, indicates that the radio is operating normally.

3.3.2 FAILURE Indicator.- The FAILURE indicator is a red LED and, when lit, indicates three types of failures (Table 3-8). Failure indicators are also monitored at the MDT. See Section 7.3 for fault isolation procedures. The ALARM/ALERT fault conditions are reported within 4 seconds of occurrence. See Section 7.3 for fault isolation procedures.

Table 3-8. Failures Indicated by FAILURE LED

Failure	Description
LO Level	The Local Oscillator signal produced by the UHF synthesizer is rectified and filtered to produce a DC voltage level that represents the amplitude of the signal. This fault indicates that the signal level of the Local Oscillator is outside of the factory established limits. The Receiver will be prevented from receiving because the frequency may not be correct. It may be possible to correct this condition by cycling the power to the unit.
Synth1 Frequency	This fault indicates that the internal Synthesizer has not locked on frequency. The Receiver will be prevented from receiving because the frequency may not be correct. It may be possible to correct this condition by cycling the power to the unit.
Synth2 Frequency	This fault indicates that the internal Synthesizer has not locked on frequency. The Receiver will be prevented from receiving because the frequency may not be correct. It may be possible to correct this condition by cycling the power to the unit.

3.3.3 ALARM/ALERT Indicator.- The ALARM/ALERT indicator is a yellow LED and, when it's flashing, it indicates 2 types of Alarms; when lit but not flashing, indicates 4 types of Alerts (Table 3-9). These messages are also monitored at the MDT. See Section 7.3 for fault isolation procedures.

Table 3-9. Faults Indicated by ALARM/ALERT LED

Alarm/ Alert	Fault	Description
Alarm	+12 V	If the Microprocessor detects an out of tolerance condition on the internal +12 VDC power supply, the Receiver will continue to operate, but a Voltage Error message is displayed. This error message is a "report" only and may or may not indicate a failure of the Receiver.
Alarm	-12 V	If the Microprocessor detects an out of tolerance condition on the internal -12 VDC power supply, the Receiver will continue to operate, but a Voltage Error message is displayed. This error message is a "report" only and may or may not indicate a failure of the Receiver.
Alert	Elapsed Time	This alert will occur when the internal elapsed time clock has failed to update. This alert is a "report" only and will not effect normal operation of the Receiver.
Alert	Mute	Mute audio level is high If mute is invoked, there should be a reduced audio level detected by the microprocessor. Depending on the mute level setting, Alert is declared if audio detected by the microprocessor is above a factory-set threshold.
Alert	Audio	The audio level is out of limits. When audio is present, the audio level detected by the microprocessor should be inside a factory-set range. Alert is declared if the audio detected by the microprocessor is outside this range.
Alert	Squelch	Audio level is high If squelch is invoked, there should be no audio detected by the microprocessor. Alert is declared if the audio level detected by the microprocessor is above a factory-set maximum threshold value.

3.3.4 Headset Operation.- The Headset audio level is adjusted using the VOLUME CONTROL knob on the front panel. When the Headset is plugged in, audio will not be present at the Speaker.

<div align="center">

WARNING

</div>

The volume level out of the headset may be loud enough to cause hearing damage. Turn the headset VOLUME CONTROL knob, located on the front panel, fully counterclockwise (volume at minimum) before putting on the headset, and then adjust the Volume Control clockwise for a comfortable audio level out of the headset.

1. Turn the headset VOLUME CONTROL knob fully counterclockwise (volume at minimum).

2. Connect the headset to the HEADSET jack on the front panel, and listen to aircraft transmissions.

3. Adjust the VOLUME CONTROL clockwise for a comfortable audio level out of the headset.

3.3.5 Speaker Operation.- The Speaker provides audio output when the Headset is not plugged in. The Speaker audio level is adjusted using the VOLUME CONTROL knob on the front panel. The procedure to adjust the Speaker audio level is the same as that for the Headset (see Section 3.3.4).

3.4 MDT OPERATION.- The MDT is used for the initial set up and configuration of the system and subsequently for monitoring and control of the equipment and its functions. The CM-300 UR receiver is capable of responding to configuration commands and status inquires via the MDT local (front) and remote (rear) connectors. The MDT uses UHF MDT software, which provides the Graphic User Interface (see Section 10).

3.4.1 Communication Standards.- A standard 9-pin, RS-232, male to female, serial cable may be used for this application. The radio only uses pins 2, 3, 4, and 5 of the cable. The rest of the pins are not used. See Table 3-10.

For a computer serial port with a DB-9 connector, pin 2 is the receive line, pin 3 is the transmit line, pin 4 is the terminal-ready line, and pin 5 is ground. On the radio MDT connector (Figure 3-4), pin 2 is the transmit line, while pin 3 is the receive line, pin 4 is the MDT_SENSE line, and pin 5 is ground.

The baud rate is 9600 with 8 data bits, 1 start bit, 1 stop bit, and with no parity.

Table 3-10. RS-232 and MDT Connector Pin Assignments

Pin Number	RS-232 Connector		CM-300 UR MDT Connector	
	Signal Name	**Signal Description**	**Signal Names**	**Signal Description**
1	DCD	Data Carrier Detect.	N/C	N/C
2	RxData	Received Data.	TxD	Transmitted Data.
3	TxData	Transmitted Data.	RxD	Received Data.
4	DTR	Data Terminal Ready.	Front Panel-MDT_SENSE Rear Panel-N/C	Disables rear MDT. N/C
5	GND	Signal Ground.	GND	GND
6	DSR	Data Set Ready.	N/C	N/C
7	RTS	Request To Send.	N/C	N/C
8	CTS	Clear To Send.	N/C	N/C
9	RI	Ring Indicator.	N/C	N/C

3.4.2 Messages from the Radio to the MDT.- The radio will update the Summary Fault Status in the MDT when a monitored parameter transitions into alarm state, into alert state, back into normal state, or fails. The status of the FAILURE and ALARM/ALERT indicators (see Tables 3-8 and 3-9) is monitored through the MDT. All possible Alarm/Alert/Fail parameters are displayed and can be sorted by clicking on the column heading (see Section 10.6.5.4.4).

The significance of a NORMAL, ALERT, ALARM, or FAILURE condition is as follows:

NORMAL -   Normal condition, receiver operational.

ALERT -   Some performance parameters degraded, receiver still operational.

ALARM -   Performance severely degraded, receiver operational status questionable.

FAILURE -   Receiver not operational, requires immediate attention

3.5 RECEIVER START-UP AND OPERATION.- The receiver may be operated continuously from an AC or DC power source alone, or both may be connected. If both are connected, the receiver will operate off of the AC power source, and the DC power source (i.e. battery) will provide emergency power in the event of an AC power failure. Switch over from AC to DC is done automatically internal to the receiver and is transparent to the operator.

***

NOTE

When the DC PWR switch is in the ON position, the receiver will draw a small amount of current from the DC power source to light the front panel DC PWR LED. Because of this, if a battery is connected to the DC power input, it may eventually be drained unless it is connected to a charging circuit.

The receiver's operating parameters are stored in non-volatile memory. These parameters are stored even when the power is turned off and prime power is removed. Parameters stored in non-volatile memory are:

- Frequency
- Audio Level
- Squelch Threshold
- Mute Level
- Squelch Status
- Elapsed Time
- Event Log
- RF Tuning Mode
- Reference Frequency

When the receiver is turned on, the receiver will operate using the configuration and operating parameters (frequency, etc.) stored in the non-volatile memory. Once the receiver is turned on, these operating parameters can be changed (see Section 10.6.5.4). The new parameters will be automatically stored in memory.

To turn the receiver on proceed as follows:

1. Make sure that the receiver set is connected for operation according to the installation instructions in Section 9.3.4.

2. If both AC and DC power have been applied to the receiver, turn the receiver on by setting both PWR ON switches to on (up position). Ensure that the power indicator LEDs on the front panel are lit.

3. If only one power source has been applied to the receiver, turn the receiver on by setting the appropriate PWR ON switch to on (up position). Ensure that the appropriate power indicator LED is lit on the front panel.

4. Allow a 30 second warm-up period. The receiver is designed to meet all operating specifications after the warm-up period.

5. If the receiver has previously been tuned, the receiver will operate using the parameters stored in memory. If the receiver has not been tuned, or the operator desires to change the receiver's configuration or operating parameters, perform the tuning procedures outlined in Section 9.6.

3.6 EQUIPMENT SHUTDOWN.- For an orderly equipment shutdown proceed as follows:

1. 1.   If you are in the process of editing radio parameters using the MDT, make sure you apply all required changes (see Section 10.6.5.2.2) before turning the radio off. If not, changes will be lost.

<div style="text-align:center;">

WARNING

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If Mute Radio is set to On from the MDT, it is imperative that it is returned to the Off setting before disconnecting the MDT. If not, radio two-way communications will be disabled which may result in very serious consequences.

2. From the MDT, return the Mute Radio to the Off setting (see Section 10.6.5.4.8).

3. Exit the UHF MDT Software and disconnect the MDT.

4. Turn the receiver off by setting both PWR ON switches off (down). Ensure that both power indicator LEDs on the receiver front panel are off.

3.7 EMERGENCY OPERATION.- Emergency operation is limited to the case where loss of AC primary power occurs.

Ensure that a 24 VDC power source has been connected to the DC power input of the receiver, according to the installation instructions in Section 9.3.4, and that the DC PWR ON switch is in the on position (up). The receiver will automatically switch over to DC power when primary AC power is lost.

SECTION 4
STANDARDS AND TOLERANCES

REFER TO THE UHF CM-300 SERIES MAINTENANCE HANDBOOK, FOR GUIDANCE AND PRESCRIBED TECHNICAL STANDARDS AND TOLERANCES, AND PROCEDURES APPLICABLE TO THE MAINTENANCE AND INSPECTION OF THE CM-300 EQUIPMENT.

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SECTION 5
PERIODIC MAINTENANCE

5.1 INTRODUCTION.- This section lists the maintenance activities that need to be performed on the CM-300 UR Receiver on a regular basis.

5.2 PERFORMANCE CHECKS.- Table 5-1 lists the regularly required performance checks necessary to ensure the CM-300 UR Receiver is operating within established tolerances and limits. Cross-reference is made in Table 5-1 to the appropriate maintenance procedure in Section 6 and to the applicable Standards and Tolerances in Section 4.

Table 5-1. Periodic Performance Checks

Performance Check	Standards and Tolerances	Maintenance Procedures
a. Ref Monitor Frequency Check	See UHF CM-300 Series Maintenance Handbook	Paragraph 6.2
b. Squelch Action and Adjustment	See UHF CM-300 Series Maintenance Handbook	Paragraph 6.3
c. Receiver Sensitivity Check	See UHF CM-300 Series Maintenance Handbook	Paragraph 6.4
d. Audio Level Check	See UHF CM-300 Series Maintenance Handbook	Paragraph 6.5
e. AGC Action Check	See UHF CM-300 Series Maintenance Handbook	Paragraph 6.6
f. IF Selectivity Check	See UHF CM-300 Series Maintenance Handbook	Paragraph 6.7

5.3 OTHER MAINTENANCE TASKS.- The following procedures may be performed on an as-required basis.

5.3.1 Tuning and Alignment.- Perform tuning procedures on an as-required basis. Refer to Sections 9.6.3 and 9.6.4.

5.3.2 Exterior Cleaning.- Perform cleaning tasks on an as-required basis to prevent deterioration of the equipment. Refer to Section 6.8.

SECTION 6
MAINTENANCE PROCEDURES

6.1 INTRODUCTION.- This section contains the procedures used to perform the periodic performance checks listed in Section 5. Each procedure lists the test equipment required, shows a block diagram of the test set-up, and gives step-by-step instructions. Measured results should meet the Standards and Tolerances of Section 4. Results should be recorded on the appropriate form each time a check is performed so that a record is kept of the receiver performance history.

In order to perform the checks, the operator should be thoroughly familiar with the operation of the front panel controls and indicators, MDT operation, and MDT software (GUI). See Sections 3 and 10.

| NOTE |

When using the UHF MDT Software to make changes to the radio parameters, change one parameter at a time. Click on Apply (or OK) to apply the change before proceeding with further changes.

| NOTE |

The procedures in this section should be performed in sequential order, starting at paragraph 6.2.

| NOTE |

The technician should take appropriate measures to ensure that air traffic will not be impacted while performing the procedures outlined in this section. This may require the technician to take the affiliated transmitter/receiver or channel out of service.

6.2 REFERENCE MONITOR FREQUENCY CHECK - The purpose of the Reference Monitor frequency check is to ensure the reference oscillator frequency is within specified limits. The frequency is measured at the REF MON test point on the receiver front panel.

   6.2.1 Test equipment

   • Hewlett Packard model HP5384A Frequency Counter, or equivalent

   • MDT

   6.2.2. Procedure

      1.   Connect the REF MON output on the receiver front panel to the frequency counter input, refer to figure 6-1.
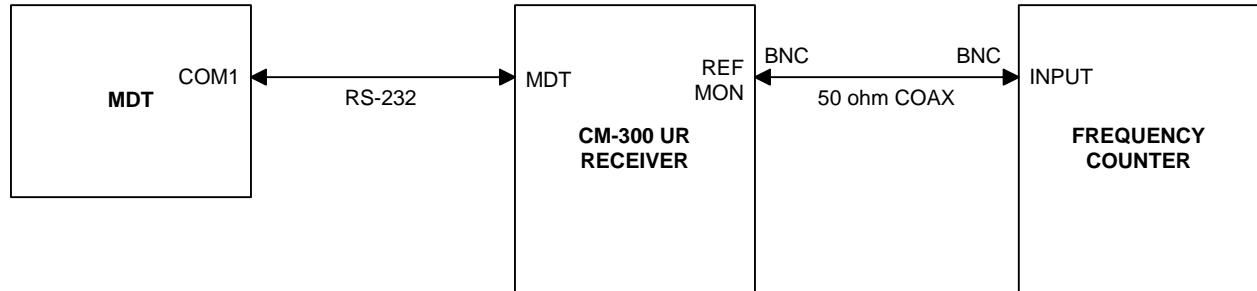
FIGURE 6-1. TEST SETUP FOR REFERENCE MONITOR FREQUENCY CHECK

2.	Measure and record the reference monitor frequency on the appropriate form. If the frequency does not meet the requirements adjust the frequency by performing step 3.

3.	From the CM-300 UR Detail Front Panel window, refer to figure 6-2:

a.   While monitoring the frequency counter, increase or decrease the frequency by clicking on the up or down arrow to the right side of the Reference Frequency box.

b.	Click the Apply button to apply the selected frequency setting.
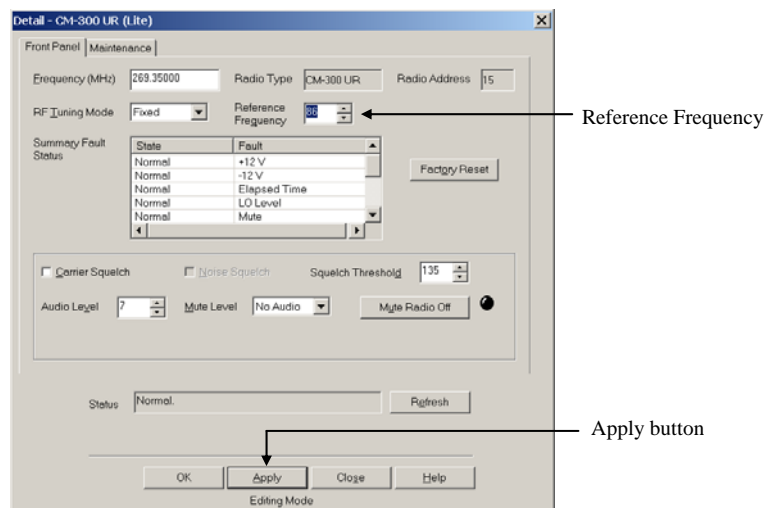
FIGURE 6-2. CM-300 UR DETAIL FRONT PANEL WINDOW – REFERENCE MONITOR FREQUENCY

c.	Repeat steps a and b until the Reference Frequency meets the standards and tolerances.

d.	Record the new reference monitor frequency on the appropriate form.

4.   Re-connect the radio for normal operation unless other maintenance checks are needed.

6.3 SQUELCH ACTION AND ADJUSTMENT - The purpose of this procedure is to adjust the squelch threshold and verify proper open and close operation of the squelch circuit.

6.3.1 Test Equipment

- Agilent E4434B Signal Generator, or equivalent

- Agilent 8903E Audio Analyzer, or equivalent

- MDT

6.3.2 Procedure

1. Connect the Signal Generator RF output to the CF1 connector on the receiver rear panel, refer to figure 6-3.

2.   Connect pins 7 and 8 of the REM INT connector on the receiver rear panel to the Audio Analyzer input, refer to figure 6-3.
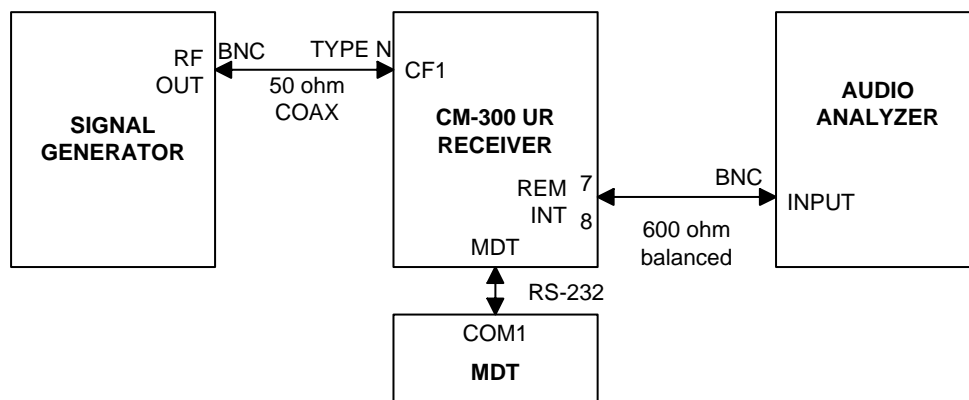
FIGURE 6-3. TEST SETUP FOR SQUELCH ACTION AND ADJUSTMENT

3.   Set front panel switches on Signal Generator to the following:

a.   Output Level = -80 dBm

b.   Signal Generator frequency to receiver operating frequency

     c.   AM = ON

     d.   FM = OFF

     e.   RF = ON

     f.   Modulation Frequency 1004 Hz

     g.   Audio Modulation Level = 30%

   4.   From the CM-300 UR Detail Window Front Panel (refer to figure 6-4):

     a.   Verify that desired receiver squelch mode is set to ON (check mark in Carrier Squelch box only, or check mark in Carrier squelch and Noise Squelch box).

     b.   Squelch Threshold = current setting.
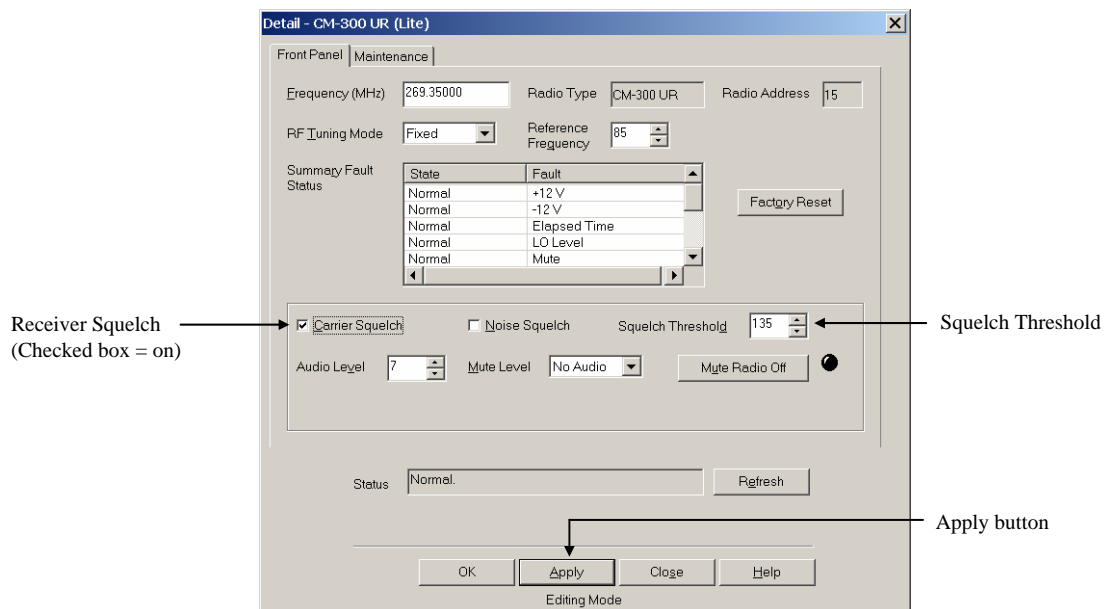
FIGURE 6-4. CM-300 UR DETAIL FRONT PANEL – SQUELCH ADJUSTMENT

   5.   Decrease the signal generator and measure the level required to activate (close) the squelch (no audio signal present on the audio analyzer). Record the close value on the appropriate form.

   6.   Increase the signal generator and measure the level required to deactivate (open) squelch (audio signal present on the audio analyzer). Record the open value on the appropriate form.

7.   If the squelch open and close measurements do not meet the standards and tolerances perform steps a through e to adjust receiver squelch.

a.   Set the signal generator to the desired RF level for squelch to open.

b.   From the CM-300 UR Detail Front Panel window, refer to figure 6-4, adjust the Squelch Threshold up or down, in small increments, until audio is present at the audio analyzer. Ensure to click the Apply button for each value selected.

c.   Decrease the signal generator and measure the level required to activate (close) the squelch (no audio signal present on the audio analyzer).

d.   Increase the signal generator and measure the level required to deactivate (open) squelch (audio signal present on the audio analyzer).

e.   Record the new squelch open and close measurements on the appropriate form.

8.   Re-connect the radio for normal operation unless other maintenance checks are needed.

6.4 AUDIO LEVEL CHECK - The purpose of this procedure is to verify the Audio Level.

6.4.1 Test Equipment

- Agilent E4434B Signal Generator, or equivalent

- Agilent 8903E Audio Analyzer, or equivalent

- MDT

6.4.2 Procedure

1.   Set the Audio Analyzer to read the audio level in dBm.

2.   Connect the Signal Generator RF Out to the CF1 connector on the receiver rear panel, as shown in figure 6-5.

3.   Connect pins 7 and 8 of the receiver REM INT connector on the receiver rear panel, to the Audio Analyzer input, as shown in figure 6-5.
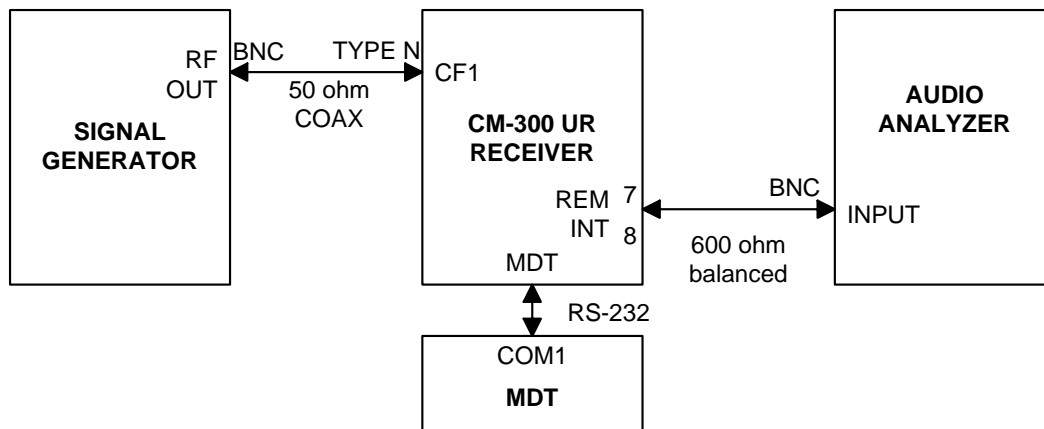
FIGURE 6-5. TEST SETUP FOR AUDIO LEVEL CHECK

4.   Set front panel switches on Signal Generator to the following:

a.   Output Level = -73 dBm

b.   Signal Generator frequency to receiver operating frequency.

c.   AM = ON

d.   FM = OFF

e.   AM Modulation Frequency = 1004 Hz

f.   Audio Modulation Level = 30%

g.   RF = ON
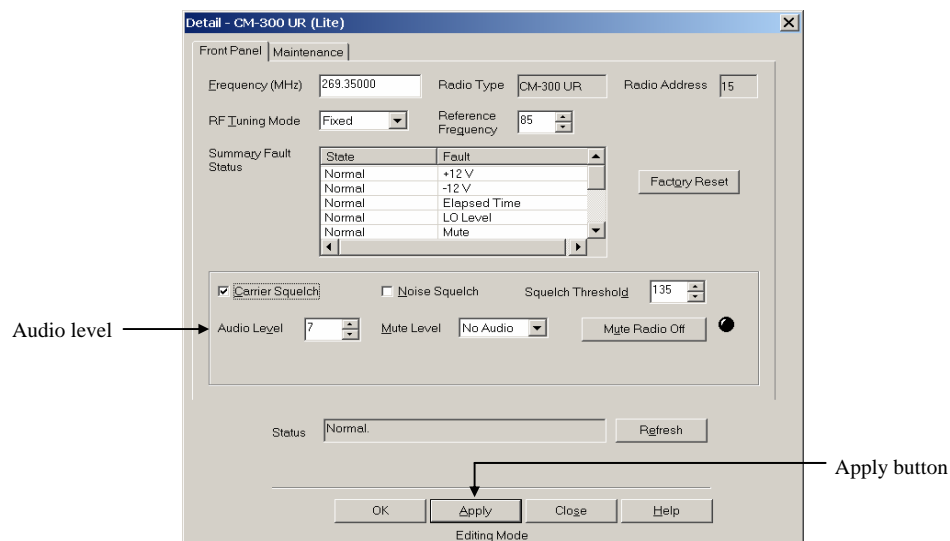
FIGURE 6-6. CM-300 UR DETAIL FRONT PANEL – AUDIO LEVEL CHECK

5.   Measure and record the AC Level of the audio power on the Audio Analyzer.

6.   If the audio level does not meet the standards and tolerances perform step 7.

7.   From the CM-300 UR Detail Front Panel window, refer to figure 6-6:

a.   While monitoring the Audio Analyzer, adjust the Audio Level until the audio power out meets the standards and tolerances. Ensure to click the Apply button for each value selected.

b.   Record the new audio level on the appropriate form.

8.   Re-connect the radio for normal operation unless other maintenance checks are needed.

6.5 RECEIVER SENSITIVITY CHECK - The purpose of the sensitivity check is to ensure the purpose of the sensitivity check is to ensure the receiver will respond to the minimum specified RF input signal level.

6.5.1 Test Equipment

- Agilent E4434B Signal Generator, or equivalent

- Agilent 8903E Audio Analyzer, or equivalent

- MDT

6.5.2 Procedure

1.   Set the Audio Analyzer to read the audio level in dBm.

2.   Connect the Signal Generator RF out to the CF1 connector on the receiver rear panel, as shown in figure 6-7.

3.   Connect pins 7 and 8 of the receiver REM INT connector on the receiver rear panel, to the audio analyzer input, as shown in figure 6-7.
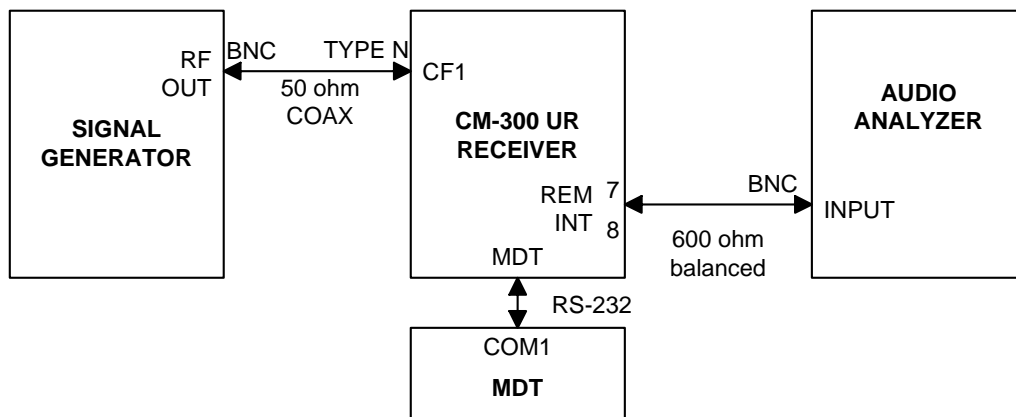
FIGURE 6-7. TEST SETUP FOR RECEIVER SENSITIVITY CHECK

4.   Set Signal Generator to the following:

a.   Output Level = -102 dBm

b.   Signal Generator frequency to receiver operating frequency

c.   AM = ON

d.   FM = OFF

e.   Modulation Frequency = 1004 Hz

f.   Audio Modulation Level = 30%

g.   RF = ON

5.   From the CM-300 UR Detail Front Panel window, set receiver squelch to OFF (no check mark in Carrier Squelch box), refer to figure 6-8.

Receiver Squelch
Box not checked = off
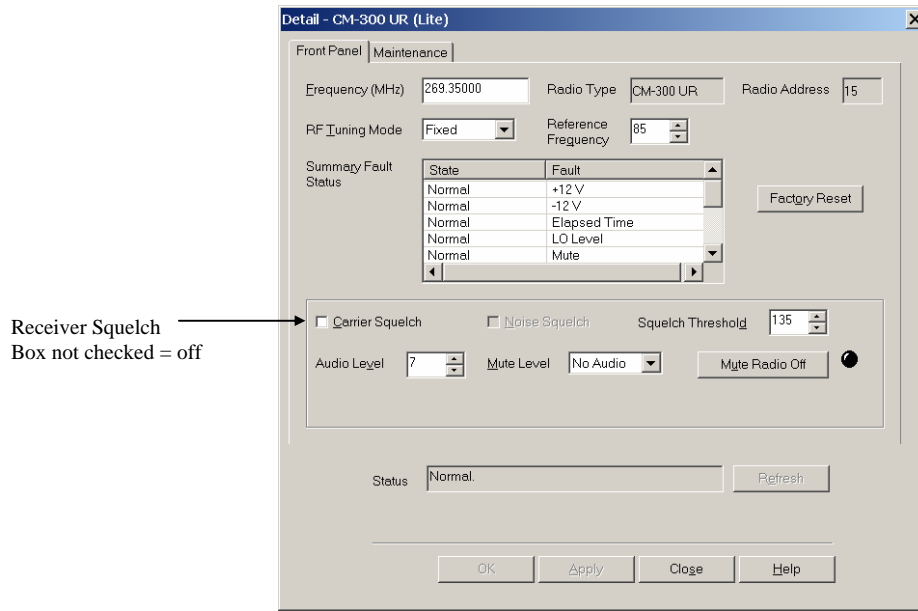
FIGURE 6-8. CM-300 DETAIL FRONT PANEL – SENSITIVITY

6.   The sensitivity of the receiver is the input level required to obtain a signal-plus-noise (modulation on) to noise (modulation off) power ratio of 10 dB at the receiver output. Vary the signal generator input to the receiver until a power ratio of 10 to 1 (voltage ratio of 3.16 to 1) is obtained on the audio analyzer when the modulation is turned on and off.

7.   Measure and record receiver sensitivity on the appropriate form.

8.   Turn the receiver squelch back on (check mark in the Carrier Squelch box).

9.   Re-connect the radio for normal operation unless other maintenance checks are needed.

6.6 AGC ACTION CHECK - The purpose of this procedure is to verify AGC operation.

    6.6.1 Test Equipment

- Agilent E4434B Signal Generator, or equivalent

- Agilent 8903E Audio Analyzer, or equivalent

- MDT

6.6.2 Procedure

     1.   Set the Audio Analyzer to read the audio level in dBm.

     2.   Connect the Signal Generator RF output to the CF1 connector on the receiver rear panel, as shown in figure 6-9.

     3.   Connect pins 7 and 8 of the receiver REM INT connector to the Audio Analyzer input, as shown in figure 6-9.
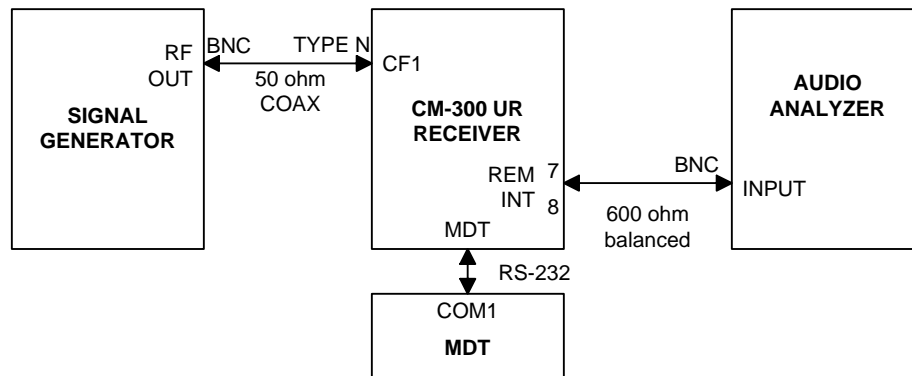

FIGURE 6-9. TEST SETUP FOR AGC ACTION CHECK

     4.   Set front panel switches on Signal Generator to the following:

     a.   Output Level = -47 dBm

     b.   Signal Generator frequency to receiver operating frequency

     c.   AM = OFF

d.   FM = OFF

     e.   AM Modulation Frequency = 1004 Hz

     f.   Audio Modulation Level = 30%

     g.   RF = ON

     5.   From the CM-300 UR Detail Front Panel window, refer to figure 6-10 and verify the receiver squelch is OFF (no check mark in Carrier Squelch box).

Receiver Squelch
Box not checked = off
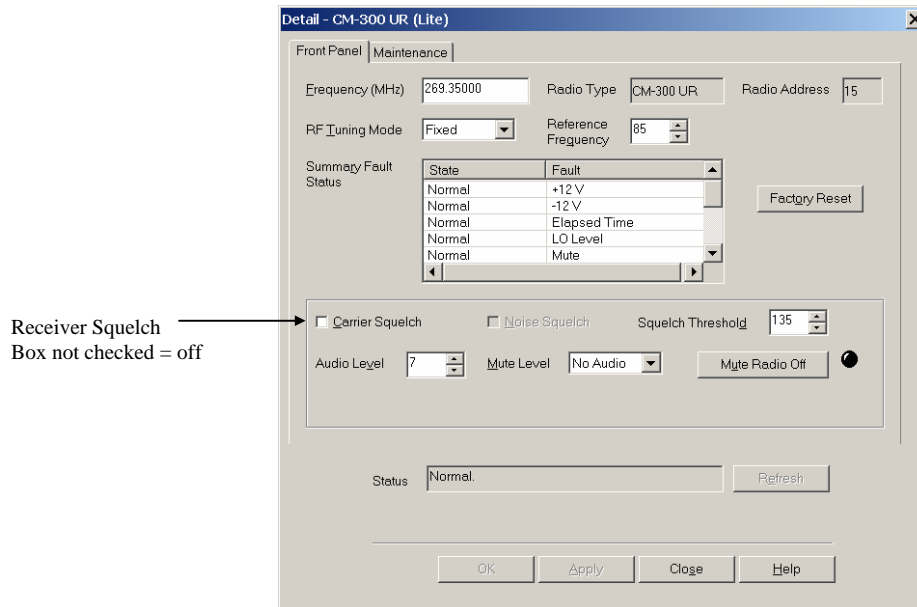
FIGURE 6-10. CM-300 DETAIL FRONT PANEL – AGC CHECK

6.   Measure audio power output level on the Audio Analyzer, and record for reference.

7.   Vary signal generator output from –102 dBm to -19 dBm while observing the receiver output on the Audio Analyzer. Measure the maximum deviation in audio level from the reference point measured in step 6.

8.   Record the results on the appropriate form.

9.   Turn the receiver squelch back on (check mark in the Carrier Squelch box).

10.   Re-connect the radio for normal operation unless other maintenance checks are needed.

6.7 IF SELECTIVITY CHECK - The purpose of this procedure is to determine the ability of purpose of this procedure is to determine the ability of the receiver to reject unwanted signals.

   6.7.1 Test Equipment

- Agilent E4434B Signal Generator, or equivalent

- Fluke 8100 Digital Voltmeter, or equivalent

- MDT

6.7.2 Procedure

1.   Connect the Signal Generator RF out to the CF1 connector on the receiver rear panel, as shown in figure 6-11.

2.   Connect the Digital Voltmeter input to the AGC TEST connector on the receiver front panel, as shown in figure 6-11.
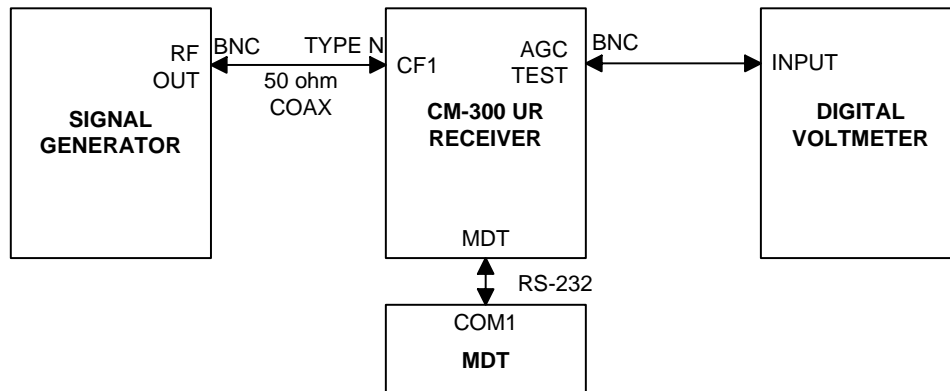
FIGURE 6-11. TEST SETUP FOR IF SELECTIVITY CHECK

3.   Set front panel switches on Signal Generator to the following:

a.   Output Level = -93 dBm

b.   Signal Generator frequency to receiver operating frequency

c.   AM = OFF

d.   FM = OFF

e.   RF = ON

4.   From the CM-300 UR Detail Front Panel window, refer to figure 6-12 and verify the receiver squelch is OFF (no check mark in Carrier Squelch box).

Receiver Squelch
Box not checked = off
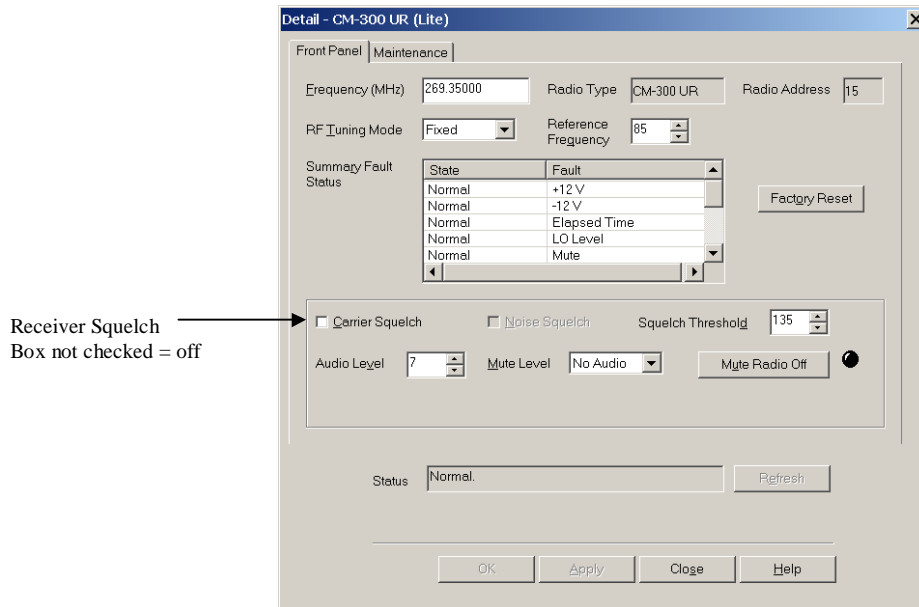
FIGURE 6-12. CM-300 UR DETAIL FRONT PANEL – SELECTIVITY

5.   Note the AGC voltage level.

6.   Increase the RF level of the Signal Generator by 6 dB (-87 dBm).

7.   Tune the frequency of the Signal Generator above the operating frequency until the AGC voltage again reads the voltage noted in step 5. Note the frequency of the signal generator.

8.   Tune the frequency of the Signal Generator below the operating frequency until the AGC voltage reads the voltage noted in step 5. Note the frequency of the signal generator.

9.   Compute the bandwidth of the 6 dB point by taking the difference between the upper and lower frequencies obtained in steps 7 and 8. Record result on the appropriate form.

10.   Increase the output of the Signal Generator by 60 dBm (-33 dBm) from the RF level in step 3 a.

11.   Tune the frequency of the Signal Generator above the operating frequency until the AGC voltage again reads the voltage noted in step 5. Note the frequency of the Signal Generator.

12.   Tune the frequency of the Signal Generator below the operating frequency until the AGC voltage again reads the voltage noted in step 5. Note the frequency of the Signal Generator.

13.   Compute the bandwidth of the 60 dB point by taking the difference between the upper and lower frequencies obtained in steps 11 and 12. Record result on the appropriate form.

14.   Turn the receiver squelch back on (check mark in the Carrier Squelch box).

15.   Re-connect the radio for normal operation unless other maintenance checks are needed.

6.8 OTHER MAINTENANCE PROCEDURES - To clean the unit's exterior, use a clean lint free cloth moistened in a solution of mild household detergent and water. Follow this with a clean lint free cloth moistened in clean water, then wipe dry. Never use harsh detergents, chemical cleaning agents, abrasive compounds, or bristle brushes to clean the unit for these may permanently mar the surface.

SECTION 7
CORRECTIVE MAINTENANCE

7.1 INTRODUCTION.- This section provides fault isolation procedures and instructions for the removal/replacement of AC and DC fuses and removal/replacement of the receiver from the rack.

In order to perform these procedures, the maintainer should be thoroughly familiar with the operation of the front panel controls and indicators, MDT operation, and MDT software (GUI). Operation of the front panel controls and indicators is provided in Section 3. Operation of the MDT software (GUI) is provided in Section 10.

7.2 WARRANTY REPAIR.- The receiver has been purchased with a warranty. The warranty expiration date is listed on a label on the rear of the receiver. If a receiver failure occurs while under warranty, follow the instructions in Appendix A for warranty service.

> **NOTE**
>
> The receiver is the Lowest Replaceable Unit (LRU). Removing the receiver cover will void the warranty resulting in repair delays and additional expense.

7.3 FAULT ISOLATION.- This paragraph provides fault isolation procedures down to the LRU. The fault isolation procedure is in tabular format. The first column identifies the failure, the second column presents the possible cause(s) of the failure, and the third column suggests a course of action. See Table 7-1 and 7-2.

When fault isolating Alert, Alarm, or Failure indications, keep in mind that some of these error messages are "report" only messages and may or may not indicate a failure of the receiver. Refer to Table 7-2.

The significance of a NORMAL, ALERT, ALARM, or FAILURE condition is as follows:

NORMAL - Normal condition, receiver operational.

ALERT -   Some performance parameters degraded, receiver still operational.

ALARM -   Performance severely degraded, receiver operational status questionable.

FAILURE - Receiver not operational, requires immediate attention.

Table 7-1. Fault Isolation

Problem	Possible Cause(s)	Suggested Course of Action
AC Power LED not lit.	1. AC PWR ON switch not on.	1. Ensure the AC PWR ON switch is in the up position.
	2. AC power cord connection incorrect or missing.	2. Ensure the AC power cord is connected to the back of the radio and to an AC power source. Also make sure the power source is providing the correct power level.
	3. AC fuses faulty.	3. Check the AC fuses and replace if required (see Section 7.4.1).
	4. AC PWR LED faulty.	4. Check the AC PWR LED status. If the radio is functional (with DC PWR off) but the AC Power LED is not lit, then the LED may be faulty. Replace radio (see Section 7.4.3 and 7.4.4).
	5. Radio power supply malfunction.	5. Replace radio (see Sections 7.4.3 and 7.4.4).
DC Power LED not lit.	1. DC PWR ON switch not on.	1. Ensure the DC PWR ON switch is in the up position.
	2. DC power cord connections incorrect or missing.	2. Ensure the DC power cord is connected to the back of the radio and to a DC power source. Also make sure the power source is providing the correct power level.
	3. DC fuse faulty.	3. Check the DC fuse and replace if required (see Section 7.4.2).
	4. DC PWR LED faulty.	4. Check the DC PWR LED status. If the radio is functional (with AC PWR off) but the DC Power LED is not lit, then the LED may be faulty. Replace radio (see Section 7.4.3 and 7.4.4).
	5. Radio power supply malfunction.	5. Replace radio (see Sections 7.4.3 and 7.4.4).

Table 7-1. Fault Isolation (Contd)

Problem	Possible Cause(s)	Suggested Course of Action
Radio does not appear to be receiving a signal.	1. Incorrect or missing connections.	1. Ensure the interface cable is connected to the REM INT connector. Ensure your RF connections are correct.
	2. Intermittent fault (not repetitive on event log after power cycle).	2. Check event log as described in Section 10.6.5.6.2. Cycle power to the radio. Turning the power off and then back on may clear the fault.
	3. Audio volume not set high enough.	3. Ensure the remote audio volume level is set high enough to hear by changing audio level per Section 10.6.5.4.7. Ensure the local audio volume is set high enough to hear by adjusting the front panel volume knob.
	4. Radio is muted.	4. The radio can be muted by either the MDT or by grounding pin 11 on the REM INT connector. Ensure that the radio is not muted by the MDT Section 10.6.5.4.8. Ensure that pin 11 on the REM INT connector is not being grounded.
	5. Radio not on the correct operating frequency.	5. Ensure the radio is set to the correct frequency per Section 9.6.3.
	6. Squelch Threshold set too high.	6. Turn off the Squelch feature as outlined in Section 10.6.5.4.6. If the radio begins to receive signals then use the procedure in 6.3 to adjust the Squelch action.
	7. Cavity filter not set correctly.	7. If using the cavity filter then ensure the radio is in the fixed mode per Section 10.6.5.4.2. Also ensure that the cavity filter is tuned to the proper frequency per Section 9.6.4.
	8. Reference oscillator frequency incorrect.	8. Ensure the reference oscillator frequency is within tolerance and adjust as required per Section 6.2.
	9. Fault indications (Alert/Alarm/Failure)	9. Check the fault status per paragraph 10.6.5.4.4. Fault isolate each Alert/Alarm/Failure indication as described in Table 7-2.

Table 7-2. Fault Isolation of Alarm/Alert/Failure Indications

Problem	Possible Cause(s)	Suggested Course of Action
	10. Persistent fault (repetitive on event log after power cycle).	10. Check event log as described in Section 10.6.5.6.2. If the condition persists, replace the radio (see Sections 7.4.3 and 7.4.4).
+12 V ALARM	If the microprocessor detects an out of tolerance condition on one of the internal DC power supply voltages, the receiver will continue to operate, but a voltage error message is displayed.	
	1. Intermittent fault. (not repetitive on event log after power cycle)	1. Check event log as described in Section 10.6.5.6.2. Cycle power to the radio. Turning the power off and then back on may clear the fault.
	2. The radio power supply is not providing the correct power level.	2. Ensure that the AC or DC power supply is providing the correct power level.
	3. Persistent fault (repetitive on event log after power cycle).	3. Check event log as described in Section 10.6.5.6.2. If the condition persists, replace the radio (see Sections 7.4.3 and 7.4.4).
-12 V ALARM	If the microprocessor detects an out of tolerance condition on one of the internal DC power supply voltages, the receiver will continue to operate, but a voltage error message is displayed.	
	1. Intermittent fault (not repetitive on event log after power cycle).	1. Check event log as described in Section 10.6.5.6.2. Cycle power to the radio. Turning the power off and then back on may clear the fault.
	2. The radio power supply is not providing the correct power level.	2. Ensure that the AC or DC power supply is providing the correct power level.

Table 7-2. Fault Isolation of Alarm/Alert/Failure Indications (Contd)

Problem	Possible Cause(s)	Suggested Course of Action
	3. Persistent fault (repetitive on event log after power cycle).	3. Check event log as described in Section 10.6.5.6.2. If the condition persists, replace the radio (see Sections 7.4.3 and 7.4.4).
Elapsed Time ALERT	This alert will occur when the internal elapsed time clock has failed to update. This alert is a "report" only and will not effect normal operation of the receiver.	
	1. Intermittent fault (not repetitive on event log after power cycle).	1. Check event log as described in Section 10.6.5.6.2. Cycle power to the radio. Turning the power off and then back on may clear the fault.
	2. Elapsed time clock has failed to update.	2. Check event log as described in Section 10.6.5.6.2. If the condition persists, replace the radio (see Sections 7.4.3 and 7.4.4).
LO Level FAILURE	The Local Oscillator signal produced by the UHF synthesizer is rectified and filtered to produce a DC voltage level that represents the amplitude of the signal. This fault indicates that the signal level of the Local Oscillator is outside of the factory established limits. The Receiver will be prevented from receiving because the frequency may not be correct. It may be possible to correct this condition by cycling the power to the unit.	
	1. Intermittent fault (not repetitive on event log after power cycle).	1. Check event log as described in Section 10.6.5.6.2. Cycle power to the radio. Turning the power off and then back on may clear the fault.

Table 7-2. Fault Isolation of Alarm/Alert/Failure Indications (Contd)

Problem	Possible Cause(s)	Suggested Course of Action
	2. Persistent fault (repetitive on event log after power cycle).	2. Check event log as described in Section 10.6.5.6.2. If the condition persists, replace the radio (see Sections 7.4.3 and 7.4.4).
Mute ALERT	Mute audio level is high If mute is invoked, there should be a reduced audio level detected by the microprocessor. Depending on the mute level setting, Alert is declared if audio detected by the microprocessor is above a factory-set threshold.	
	1. Intermittent fault (not repetitive on event log after power cycle).	1. Check event log as described in Section 10.6.5.6.2. Cycle power to the radio. Turning the power off and then back on may clear the fault.
	2. Persistent fault (repetitive on event log after power cycle).	2. Check event log as described in Section 10.6.5.6.2. If the condition persists, replace the radio (see Sections 7.4.3 and 7.4.4).
Audio Over Threshold ALERT	The audio level is out of limits. When audio is present, the audio level detected by the microprocessor should be inside a factory-set range. Alert is declared if the audio detected by the microprocessor is outside this range.	
	1. Intermittent fault (not repetitive on event log after power cycle).	1. Check event log as described in Section 10.6.5.6.2. Cycle power to the radio. Turning the power off and then back on may clear the fault.

Table 7-2. Fault Isolation of Alarm/Alert/Failure Indications (Contd)

Problem	Possible Cause(s)	Suggested Course of Action
	2. Persistent fault (repetitive on event log).	2. Check event log as described in Section 10.6.5.6.2. If the condition persists, replace the radio (see Sections 7.4.3 and 7.4.4).
Squelch ALERT	Audio level is high If squelch is invoked, there should be no audio detected by the microprocessor. Alert is declared if the audio level detected by the microprocessor is above a factory-set maximum threshold value.	
	1. Intermittent fault (not repetitive on event log after power cycle).	1. Check event log as described in Section 10.6.5.6.2. Cycle power to the radio. Turning the power off and then back on may clear the fault.
	2. Persistent fault (repetitive on event log after power cycle).	2. Check event log as described in Section 10.6.5.6.2. If the condition persists, replace the radio (see Sections 7.4.3 and 7.4.4).
Synth1 Frequency FAILURE	This fault indicates that the internal Synthesizer has not locked on frequency. The receiver will be prevented from receiving because the frequency may not be correct. It may be possible to correct this condition by cycling the power to the unit.	
	1. Intermittent fault (not repetitive on event log).	1. Check event log as described in Section 10.6.5.6.2. Cycle power to the radio. Turning the power off and then back on may clear the fault.
	2. Persistent fault (repetitive on event log).	2. Check event log as described in Section 10.6.5.6.2. If the condition persists, replace the radio (see Sections 7.4.3 and 7.4.4).

Table 7-2. Fault Isolation of Alarm/Alert/Failure Indications (Contd)

Problem	Possible Cause(s)	Suggested Course of Action
Synth2 Frequency FAILURE	This fault indicates that the internal Synthesizer has not locked on frequency. The receiver will be prevented from receiving because the frequency may not be correct. It may be possible to correct this condition by cycling the power to the unit.	
	1. Intermittent fault (not repetitive on event log after power cycle).	1. Check event log as described in Section 10.6.5.6.2. Cycle power to the radio. Turning the power off and then back on may clear the fault.
	2. Persistent fault (repetitive on event log after power cycle).	2. Check event log as described in Section 10.6.5.6.2. If the condition persists, replace the radio (see Sections 7.4.3 and 7.4.4).

7.4 REMOVAL/REPLACEMENT PROCEDURES.- This section provides removal/replacement procedures of AC and DC fuses and removal/replacement of the receiver from the rack.

7.4.1 Remove /Replace AC Fuses.- Two 0.5 A 250 V, 5X20 mm fuses are located just above the 120 VAC/60 Hz power connector at the rear panel. The fuses are in a double pole holder (see Figure 7-1). To remove/replace the AC fuses, proceed as follows:

> **WARNING**

> **High voltage and current are present at the AC and DC power connectors at the rear of the unit. Remove all power before proceeding with the removal/replacement procedures. Failure to do so, may result in serious bodily injury.**

1. Grab and squeeze inwards the release tabs on either side of the fuse holder and pull the fuse holder out.

2. Pull fuses out of the fuse holder and replace with new fuses (see Table 8-1 for part numbers).

3.   Place fuse holder into fuse cavity and push gently until it locks into place.

7.4.2 Remove /Replace DC Fuse.- A 1 A 250 V, 5X20 mm fuse is located just left of the 24 VDC IN power connector at the rear panel. The fuse is in a single pole spring-loaded holder (see Figure 7-1). To remove/replace the DC fuse, proceed as follows:

> **WARNING**

> **High voltage and current are present at the AC and DC power connectors at the rear of the unit. Remove all power before proceeding with the removal/replacement procedures. Failure to do so, may result in serious bodily injury.**

1. Using a flat-head screwdriver, push the DC fuse holder gently inwards and turn counterclockwise (about one half turn) until the fuse holder pops out.

2. Pull fuse out of holder and replace with new fuse (see Table 8-1 for part number).

3. Place fuse holder into fuse cavity and push gently inwards. Turn clockwise (about one half turn) until the fuse holder locks into place.
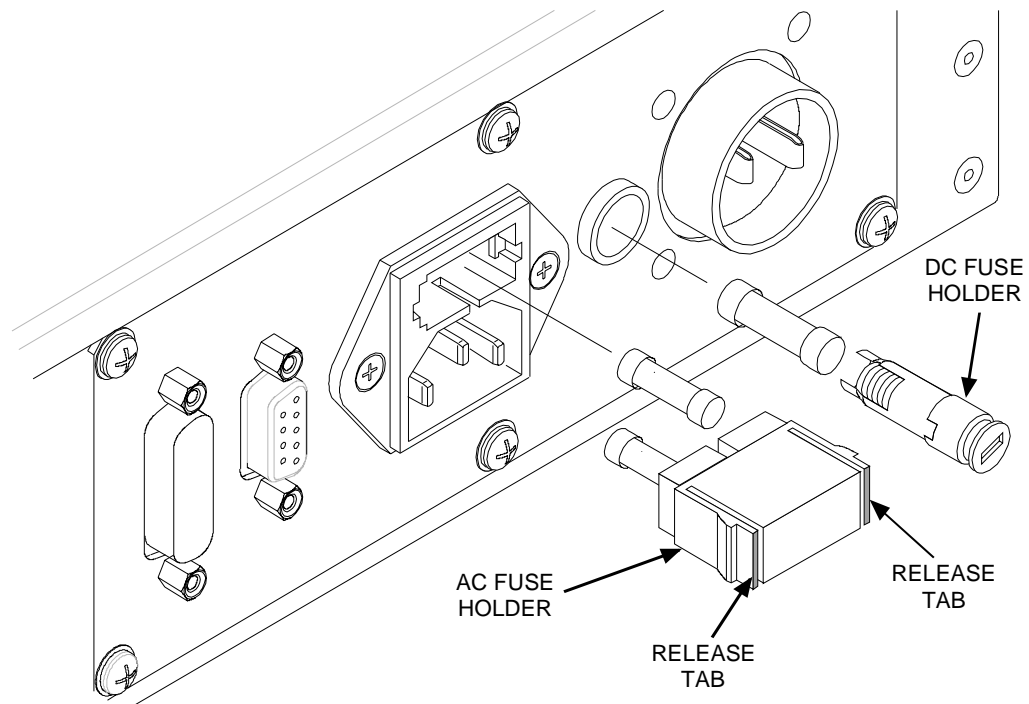
Figure 7-1. Remove/Replace AC and DC Fuses

7.4.3 Remove Receiver From the Rack.- Refer to Figure 7-2 and proceed as follows:

WARNING

High voltage and current are present at the AC and DC power connectors at the rear of the unit. Remove all power before proceeding with the deinstallation procedures. Failure to do so, may result in serious bodily injury.

1. Remove all power from the receiver.

2. Remove all front attaching cables.

3. Remove the front panel hold down screws.

4. Slide the receiver out from the rack until it hits the slide stops and disconnect the rear panel attached cables.

5. On the rear of each slide, left and right, press the slide release buttons, pulling the receiver and inner slide assembly out from the rack.

6. Remove the inner slide from the receiver to facilitate packing. Refer to Section 9.3.2.
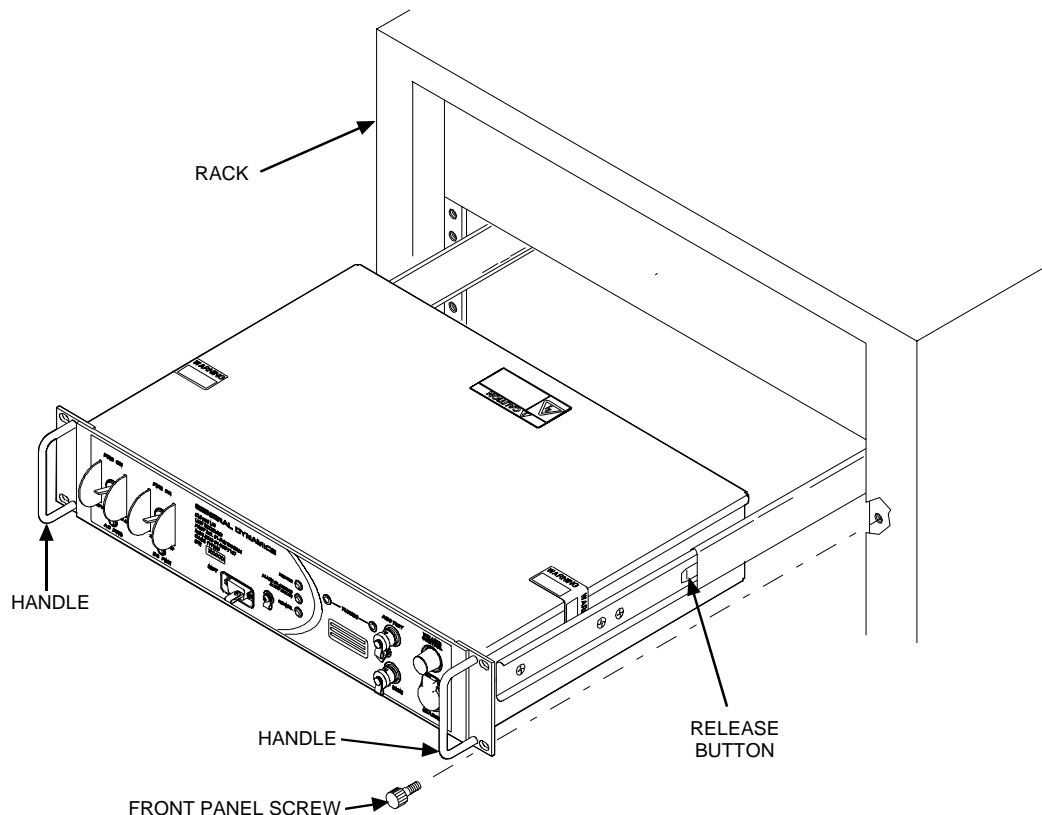
Figure 7-2. Remove/Replace Receiver

7.4.4 Replace Receiver Into the Rack.- Refer to Figure 7-2 and proceed as follows:

$$\boxed{\textbf{NOTE}}$$

Each slide pair is made up of separate inner and outer pieces. Prior to shipping/replacement, the inner slide will need to be removed from the faulty receiver and re-attached to the replacement receiver before rack installation. Refer to Section 9.3.2.

1. Install inner slide onto replacement receiver. Refer to Section 9.3.2.

2. Lift the replacement receiver into position, and mate the receiver slides to the rack slides.

3. Push the receiver part way into the rack until the release button is engaged leaving enough room to attach the cables to the receiver rear panel.

4. Connect the cables to the receiver as described in paragraph 9.3.4.

$$\boxed{\textbf{WARNING}}$$

High voltage and current are present at the AC and DC power connectors at the rear of the unit. Take extra care while performing the cabling procedures. Failure to do so may result in serious bodily injury.

5. Push the receiver the rest of the way into the rack, being careful not to pinch or bind the cables.

6. Once the receiver is fully seated, install hold down screws into the rack through the slots at both sides of the front panel.

7.5 OPERATIONAL CHECKS.- Perform Set-up and Operational Checkout procedures to verify proper operation. See Section 9.6.

SECTION 8
PARTS LIST

8.1 INTRODUCTION.- This section provides a list of spare parts (to the LRU level) together with their manufacturer, part number, and NSN.

8.2 WARRANTY INFORMATION.- Parts under warranty. Refer to Appendix A for warranty information.

8.3 PARTS LIST.- A list of parts, together with their manufacturer, part number, and NSN, is provided in Table 8-1.

Table 8-1. Parts List

Part Description	Manufacturer	Part Number	NSN
CM-300 UR UHF Receiver	General Dynamics Decision Systems	01-P40100G001	5840-01-505-7137
Technical Instruction Book (TI 6620.8)	General Dynamics Decision Systems	68-P40108G	7610-01-511-7746
AC Fuse **0.5A 250V**	Schurter	0001.1001	5920-01-514-2322
DC Fuse **1A 250V**	Schurter	0001.1004	5920-01-514-2306
CM-300 UR KIT Contains the items below	General Dynamics Decision Systems	67-P40160G001	
- Jumper Cable	General Dynamics Decision Systems	30-P40236G001	
- AC Power Cable		0EM-0299	
- DC Power Cable	General Dynamics Decision Systems	30-P30121P002	
- **Slide Package**	Chassis Track	CC7502-00-0110	

Table 8-1. Parts List (Contd)

Part Description	Manufacturer	Part Number	NSN
- Interface Connector Mate DB-15			
-Receptacle	AMP/Tyco Electronics	205205-2	
-**Contact** (socket) 15	AMP/Tyco Electronics	66504-9	
-Backshell	AMP/Tyco Electronics	207908-4	
- MDT Connector Mate DB-9			
-Plug	AMP/Tyco Electronics	205204-3	
-Contact (pin) 18	AMP/Tyco Electronics	66506-9	
-**Backshell**	AMP/Tyco Electronics	207908-1	

SECTION 9
INSTALLATION, INTEGRATION, AND CHECKOUT

9.1 INTRODUCTION.- This section contains instructions for packing and unpacking, installing, integrating, tuning, and checking the CM-300 UR receiver.

9.2 UNPACKING AND PACKING.- Two different methods are used to pack the receiver for shipping depending upon whether or not the receiver is to be stored for long periods of time once it reaches its destination (as in the case of spares). In all cases, the receivers are wrapped in plastic, encased in a two-piece, molded foam shell and shipped in a cardboard container. Receivers that are to be stored for long periods are also packed with a moisture-absorbing desiccant, and sealed in a plastic outer bag before being placed in the container. This plastic bag should only be opened for inspection or when the receiver is ready for use. Check the outside of the container before opening for a label that indicates the unit was packed by "Method 2" packaging. If the container is labeled as such, be extremely careful when opening the container not to cut or tear the sealed plastic bag that surrounds the unit.

9.2.1 Unpacking.- To unpack, open the outer cardboard container, and remove the top half of the two-piece molded shell. This will expose the bag containing the slides, cables, manual and other accessories that is taped to the top of the receiver. Cut the tape and remove these items, then pull the receiver up and out of the bottom half of the molded shell. Once unpacked, the receiver should be inspected for broken connectors, damaged switches, or other damage. Verify the contents of the shipping container against the packing list and
Table 1-4 to insure all cables, slides, and hardware are included. Retain the packing list and the shipping container until the receiver has been installed and is operating properly. Table 1-2 lists packed and unpacked receiver dimensions.

9.2.2 Packing.- If possible, the original shipping container and molded foam shells should be retained and used to pack the receiver for later shipping. To pack the receiver, wrap the receiver in plastic and seat the receiver in the bottom half of the foam shell. Place the top half of the foam shell over the receiver, and place entire unit inside the shipping container. Tape the container closed with strapping or package tape. If the original packing materials are not available, the receiver should be packed in a cardboard container surrounded on all sides by a rigid foam so that the receiver is protected and does not shift in the container. Tape the container closed with strapping or package tape.

9.3 INSTALLATION.- The receiver is designed to be installed into a standard 19 inch wide, 22 inch depth rack. A slide kit containing two pairs of slides, plus the necessary hardware, is provided for installation of the receiver into the rack. Install the slides according to the instructions in paragraph 9.3.2. Rack mounting brackets must also be installed, but are not supplied with the receiver. Information on the rack mounting brackets is found in paragraph 9.3.1. Once the slides and rack mounting brackets are installed, the receiver can be installed in the rack according to instructions in paragraph 9.3.3, and the cabling connections can be made per paragraph 9.3.4.

9.3.1 Rack Mounting Brackets.- Figure 9-1 shows drawings of the rack mounting brackets required for installation of the receiver. These rack mounting brackets can also be modified for installation of the receiver into other racks. Four rack mounting brackets are required for fixed installation (Figure 9-2). The rack mounting brackets can be ordered. See Table 1-5 for the NSN.

Figure 9-1. Rack Mounting Brackets
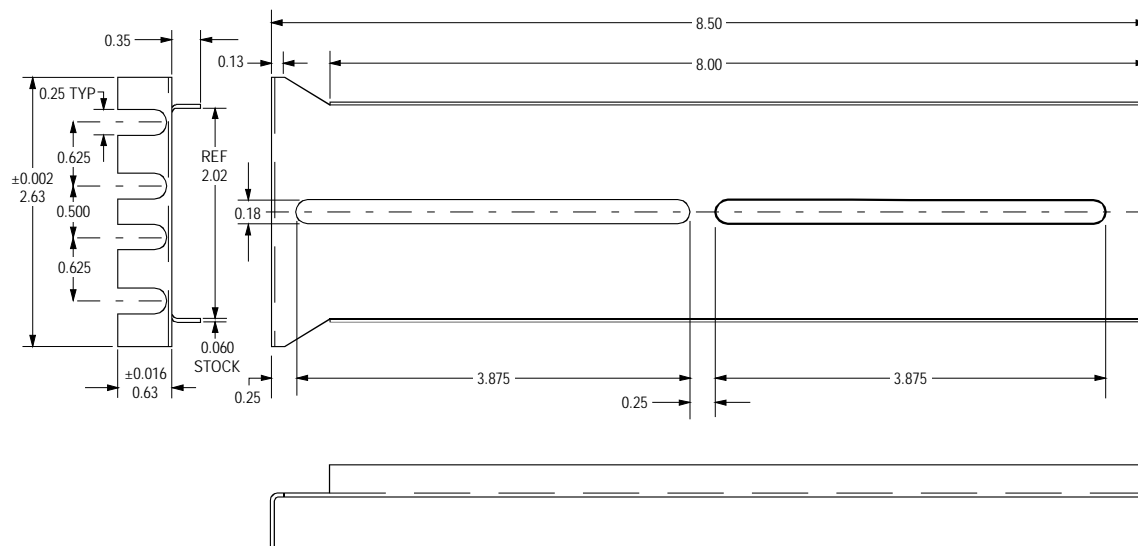
9.3.2 Slides.- Each slide pair must be separated into its inner and outer pieces prior to installation. Attach the outer pieces of each pair to the corresponding rack mounting brackets in the rack, with the rubber stop positioned towards the rear of the rack as shown in Figure 9-2. Attach the inner pieces of each pair of slides to each side of the receiver chassis as shown in Figure 9-3. Take care to position the slides on either side of the receiver chassis so that the slide release is at the rear of the chassis.

9.3.3 Installing the Receiver Into the Rack.- Make sure the rack mounting brackets and slides are installed as shown in Figures 9-2 and 9-3. Install receiver into the rack as described in Section 7.4.4.
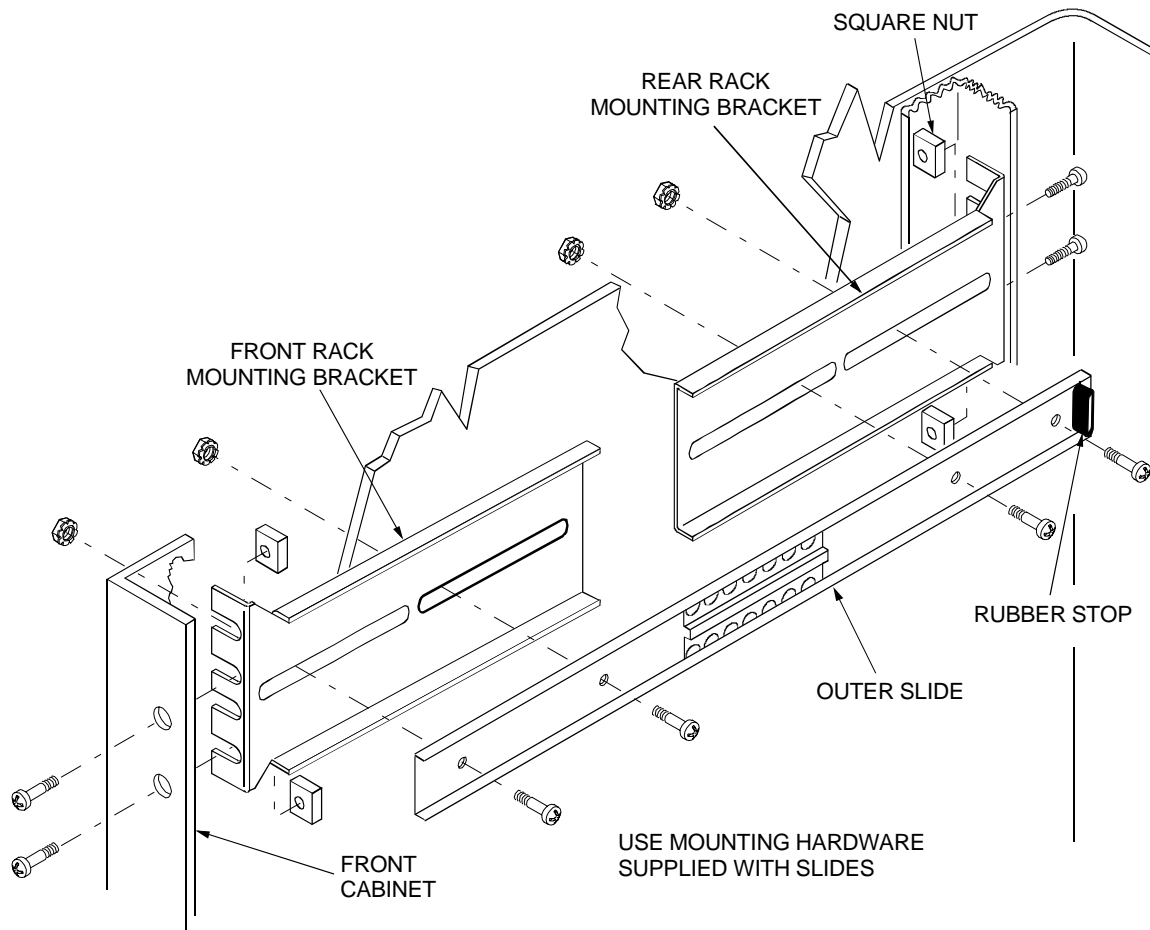
Figure 9-2. Installation of Slides and Rack Mounting Brackets to Rack
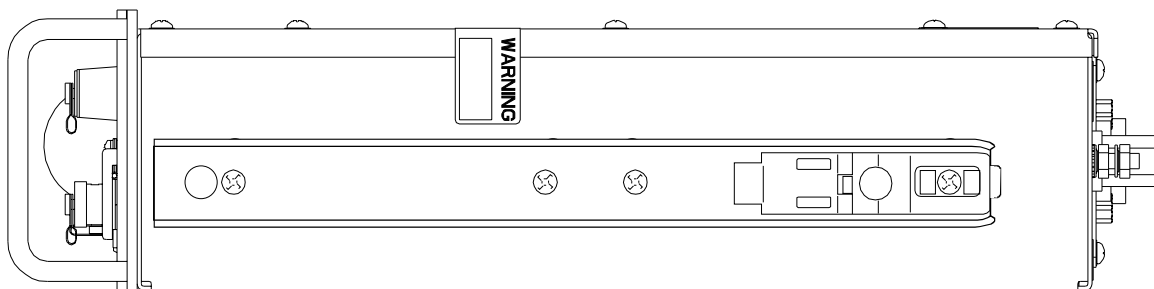
Figure 9-3. Installation of Slides to Receiver

9.3.4 Cabling Connections.- The location of front and rear panel connectors are illustrated in Figures 3-1 and 3-2 and described in Tables 3-1 and 3-2. The pin outs and electrical signal descriptions for the REM INT, MDT, 120 VAC/60 Hz, 24 VDC IN, and HEADSET connectors are listed in Tables 3-3 through 3-7. The REM INT and MDT pin locations are shown in Figures 3-3 and 3-4. Figure 9-4 below provides a block diagram view of the front and rear panel connectors and their destination.
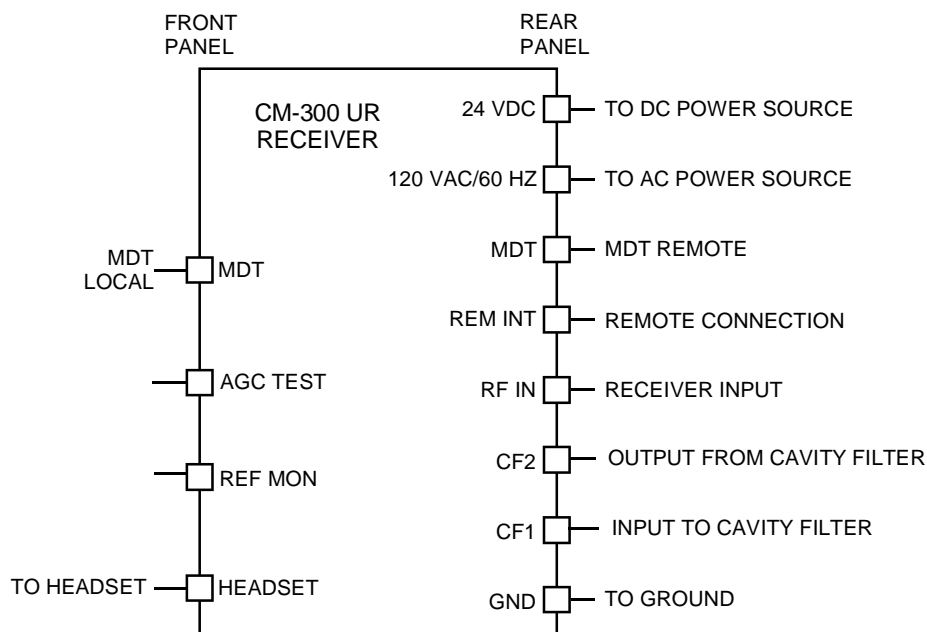
Figure 9-4. Cabling Connections

Connect permanent cables as follows:

1. Connect the AC power cord to the 120 VAC/60Hz power input connector on the receiver back panel, and connect the other end to the primary AC power source.

2. Connect one end of the DC power cord to the 24 VDC IN power input connector on the receiver back panel, and connect the other end to the DC power source.

$$\boxed{\textbf{NOTE}}$$

When the 24 VDC 1 AMP PWR ON switch is in the ON position, the receiver will draw a small amount of current from the DC power source to light the front panel DC PWR LED. Because of this, if a battery is connected to the DC power input, it may eventually be drained unless it is connected to a charging circuit.

3. For Remote Tuning Mode, connect the antenna cable to the RF IN antenna input on the receiver back panel. For Fixed Tuning Mode, connect the antenna cable to the CF1 connector on the receiver back panel and connect RF IN to CF2 with a jumper cable (see Figures 1-3 and 1-4).

4. Connect the Remote Interface cable to the REM INT connector on the receiver back panel. If the connector on the Remote Interface cable is not compatible with the mating connector on the receiver, assemble the new connector and back shell (supplied with the receiver). Follow the assembly instructions in Section 9.3.5.

5. Connect a strap from the GND ground post on the receiver back panel to ground on the equipment rack. A 0.125 inch tin-coated copper braid is preferred.

6. Use jumper cables provided to accomplish the required equipment configuration. Refer to paragraph 1.3 and Figures 1-3 and 1-4, as required.

9.3.5 Assembly Instructions for the REM INT and MDT Connector Mates.- The REM INT connector mate is a 15-socket receptacle. The MDT connector mate is a 9-pin plug. The parts required for this assembly consist of a Receptacle or Plug, Contacts, and Backshell, supplied with the radio (see Table 1-4). The contacts are crimp type, and require a crimping tool to install (see Figure 9-5).

Section 1, Table 1-4, lists the part numbers for the Receptacle, Plugs, Contacts, and Backshells. Table 1-5, lists the part number for the crimping tool. Tables 3-3 and 3-4 give the signal descriptions for the mating connectors for the REM INT and MDT connectors respectively. The MDT cable is a standard one-to-one DB-9 male to DB-9 female cable.

$$\boxed{\textbf{NOTE}}$$

Before using the crimping tool to crimp desired contacts, verify and adjust the crimp height according to manufacturer's specification.

Refer to Figure 9-5, and proceed as follows:

1. On the REM INT or MDT cable label the wires with correct pin number (see Figures 3-3 and 3-4 and Tables 3-3 and 3-4). Ensure that wire gauge is 20 AWG.

2. Slip the replacement connector backshell, supplied with the radio, over the cable.

3. Strip the ends of the wires back approximately 2.54 mm (0.1 inches) taking care not to nick or cut wire strands.

4. Select applicable contacts and identify the appropriate crimping chamber according to the wire size marking on the crimping tool.

5. Hold the crimping tool so that the front (locator side) is facing you. Squeeze handles together and allow them to open fully.

6. Insert contact, mating end first, into the hole in the locator which corresponds with the appropriate crimping chamber. Make sure that the open "U" of the wire barrel and insulation barrel face the stationary jaw.

CAUTION

Do not attempt to close the tool handles when the locator contact retainer is between the dies. Damage to the tool jaws or locator may result.

7. Slide the locator contact retainer out from between the dies (spring tension will pull the locator down). Make sure that the wire stop enters the contact wire stop slot between the wire barrel and contact shoulder. Release contact retainer.

CAUTION

Make sure that both sides of the contact insulation barrel are started evenly into the crimping chamber. Do NOT attempt to crimp an improperly positioned contact.

8. Hold the contact in position and squeeze the tool handles together until ratchet engages sufficiently to hold the contact in position. Do NOT deform insulation barrel or wire barrel.

9. Insert stripped wire into contact insulation and wire barrels until it is butted against the wire stop.

10. Holding the wire in place, squeeze tool handles together until ratchet releases. Allow tool handles to open and remove crimped contacts.

11. Repeat steps 4 through 10 for all of the wires.

12. Using an insertion tool, insert the crimped pins (or sockets) into the appropriate holes (see Figures 3-3 and 3-4) on the connector body making sure they are firmly seated.

13. Once all contacts have been inserted into connector, assemble connector backshell to connector body.
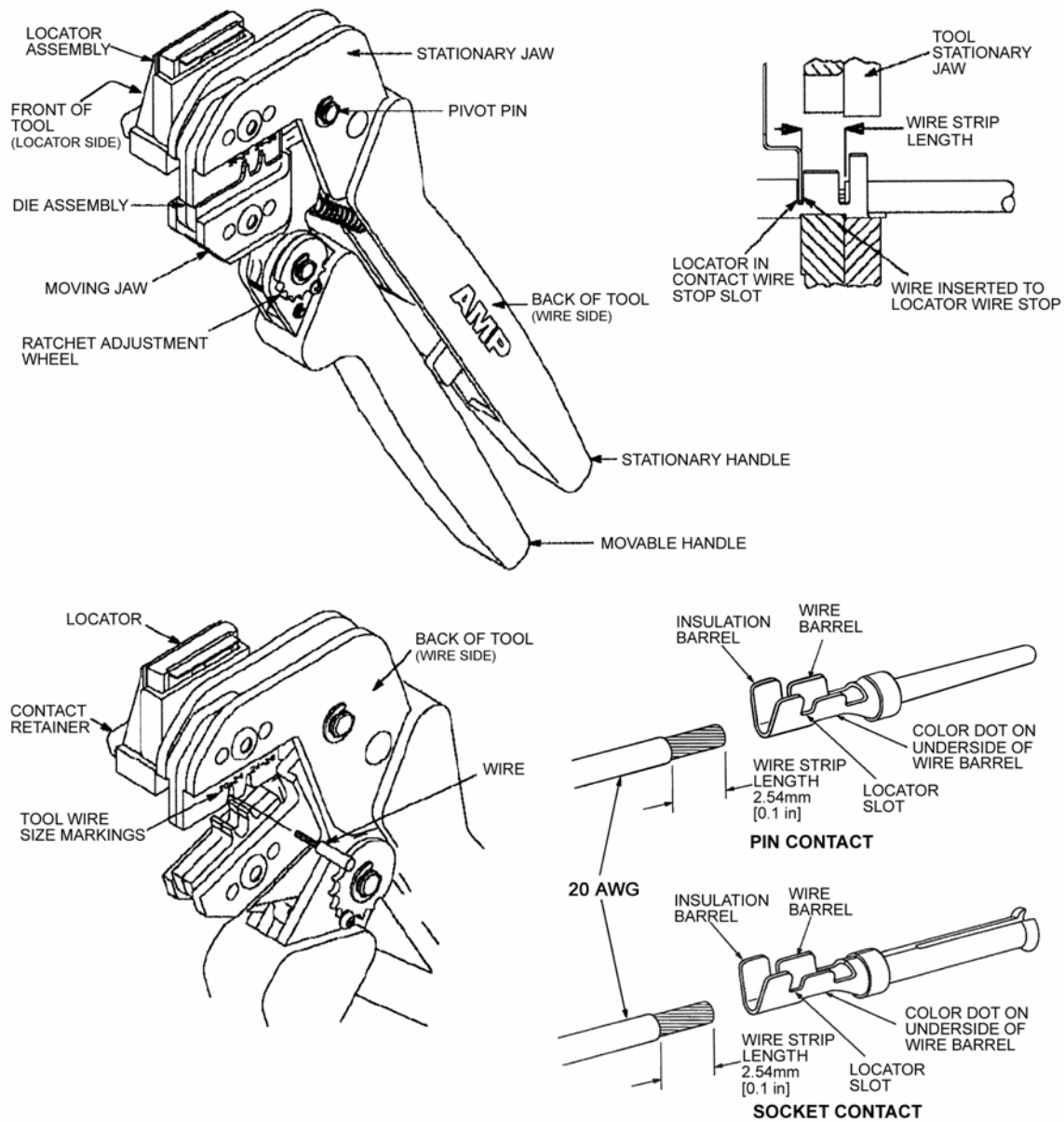
Figure 9-5. Crimping Tool and Contacts

9.4 INTERFACE CHARACTERISTICS.- Connector Interface Pin Outs for the REM INT, MDT, 120 VAC/60 Hz, 24 VDC IN, and HEADSET connectors are listed in Tables 3-3 through 3-7. Pin locations for the REM INT and MDT connectors are shown in Figures 3-3 and 3-4.

9.5 MDT CONNECTION, UHF MDT SOFTWARE INSTALLATION, AND MDT SET-UP .- This information is provided in Sections 10.3, 10.4, and 10.5.

9.6 CM-300 UR SET-UP AND OPERATIONAL CHECKOUT .- This section provides instructions on how to perform the set-up and operational checkout procedures. These procedures should be performed in the order shown below:

1. Set radio address – Section 9.6.1
2. Check reference monitor frequency – Section 9.6.2
3. Set receiver frequency – Section 9.6.3
4. Tune cavity filter – Section 9.6.4
5. Set squelch threshold level – Section 9.6.5
6. Check squelch action and adjustment – Section 9.6.6
7. Set audio level – Section 9.6.7
8. Check audio level – Section 9.6.8
9. Set mute level – Section 9.6.9
10. Check receiver sensitivity – Section 9.6.10

These procedures assume that:

- The receiver has been properly installed as described in Section 9.3
- The receiver has been cabled as described in Section 9.3
- The receiver has been powered up as described in Section 3.5
- The MDT is connected to the transmitter as described in Section 10.3
- The MDT software is loaded as described in Section 10.4.
- The user is familiar with the operation of the front panel controls and indicators as described in Section 3.2.
- The user is familiar with the operation of the UHF MDT software (GUI) as described in Section 10.
- The radio is at its factory default settings.

NOTE

To ensure the radio is at its default settings a factory reset should be performed. To perform a factory reset, refer to Section 10.6.5.4.5.

$$\boxed{\textbf{NOTE}}$$

When using the UHF MDT Software to make changes to the radio parameters, change one parameter at a time. Click on Apply (or OK) to apply the change before proceeding with further changes.

9.6.1 Set Radio Address.- The radio may be set to any one of 16 addresses. The radio address is set by the binary state of pins 1 (ADDR_0), 2 (ADDR_1), 9 (ADDR_2), and 10 (ADDR_3) of the REM INT connector (see Table 9-1). The binary state of these pins is set by the state of the corresponding pins on the mating cable connector. These wires may be connected to pin 12 (GND) of the REM INT cable connector to provide the addresses listed in Table 9-1. The default address is 15.

Ground = 0   N/C = 1

Table 9-1. Receiver Address

Pin 10 (ADDR_3)	Pin 9 (ADDR_2)	Pin 2 (ADDR_1)	Pin 1 (ADDR_0)	Radio Address
0	0	0	0	00
0	0	0	1	01
0	0	1	0	02
0	0	1	1	03
0	1	0	0	04
0	1	0	1	05
0	1	1	0	06
0	1	1	1	07
1	0	0	0	08
1	0	0	1	09
1	0	1	0	10
1	0	1	1	11
1	1	0	0	12
1	1	0	1	13
1	1	1	0	14
1	**1**	**1**	**1**	**15**

9.6.2 Check Reference Monitor Frequency.- Perform a Reference Monitor Frequency Check using the procedure listed in Section 6.2.

9.6.3 Set Receiver Frequency.- The purpose of this procedure is to set the receiver's operating frequency.

1.   Using the MDT, access the CM-300 UR Detail Window (see Sections 10.5 and 10.6.4.3).

2.   In the Detail Window Front Panel tab, set the receiver to the desired frequency (see Section 10.6.5.4.1).

NOTE

The receiver frequency can also be set using the CM-300 UR Radio Control Window (see Sections 10.6.4.1).

9.6.4 Tune Cavity Filter .- The purpose of this tuning procedure is to adjust both sections of the tunable cavity filter for optimum response at the receiver operating frequency. Maximum AGC voltage on the AGC TEST point at the desired frequency indicates that the filter is properly tuned. The test set-up is shown in Figure 9-6. Adjust the filter using a small flat-head screwdriver.
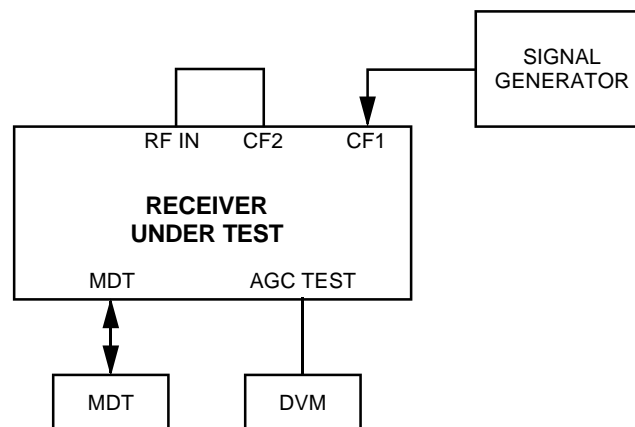
Figure 9-6. Test Set-Up for Cavity Filter Tuning

9.6.4.1 Test Equipment.-

· Agilent E4434B Signal Generator, or equivalent

· Fluke 8100A Digital Voltmeter (DVM), or equivalent

· Agilent 8903E Audio Analyzer, or equivalent

· Xcelite R3323 Screwdriver, or equivalent

· MDT

9.6.4.2 Procedure.-

1.   Set the CM-300 UR to the fixed tuning mode through the MDT (see Section 10.6.5.4.2).

2. Connect the DVM to the AGC TEST connector as shown in Figure 9-6.

3. Set the DVM to measure DC Voltage.

4. Connect the Signal Generator RF output to the CF1 input as shown in Figure 9-6.

5. Set front panel switches on Signal Generator to the following:

   a. Output Level = -20 dBm.
   b. Signal Generator frequency to receiver operating frequency.
   c. AM = OFF
   d. FM = OFF
   e. RF = ON

6. Ensure that CF2 is connected to RF IN.

7. Using a flat-head screwdriver (Xcelite R3323 or equivalent), adjust left TUNING port and right TUNING port clockwise until rotation stops.

<div align="center">

CAUTION

</div>

Tuning capacitors are extremely fragile. Be careful to use minimum force as capacitors approach the end of their adjustment range to prevent damage.

8. On Figure 9-7, below, locate the approximate number of turns required to preset filter to operating frequency.
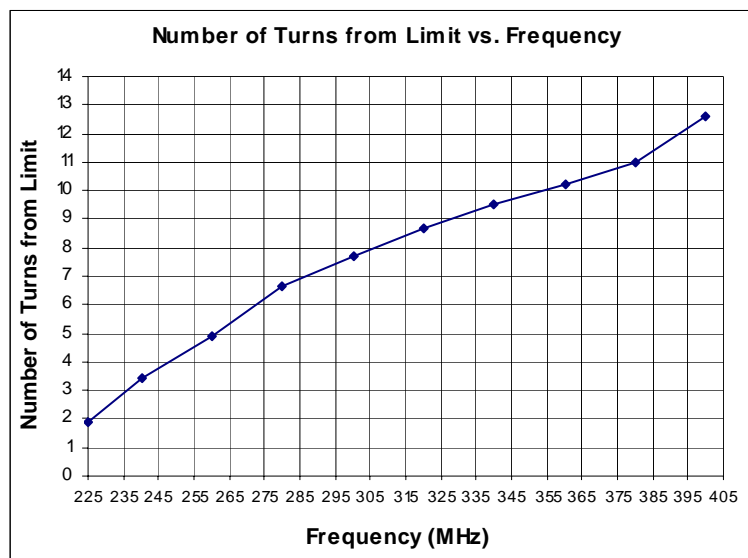
Figure 9-7. Cavity Filter Tuning Preset Chart

9. Adjust left TUNING port and right TUNING port counterclockwise the number of turns indicated in step 7.

10. Adjust Signal Generator amplitude until AGC voltage is approximately 4 VDC. The power required from Signal Generator may be as high as 0 dBm.

NOTE

> If the available signal generator can not supply 0 dBm, it is recommended that a signal generator with a maximum RF output of –13 dBm is used to adjust the AGC voltage as near to 4 VDC as possible.

11. Adjust left TUNING port for maximum reading on the DVM.

12. Adjust right TUNING PORT for maximum reading on DVM.

13. Set DVM to 3 VDC range.

14. Adjust Signal Generator amplitude until DVM reads approximately 2.5 VDC.

15. Alternately adjust left TUNING port and right TUNING port to obtain maximum voltage. If DVM reads more than 3 volts, reduce Signal Generator amplitude until DVM reads approximately 2.5 volts, and continue with adjustments. The filter is properly tuned when any change to either TUNING port left or TUNING port right causes a decrease in AGC voltage.

9.6.5 Set Squelch Threshold Level.- There are two modes of squelch that can be used on the receiver. The Carrier Squelch is based on the RF signal level. The Audio Signal-to-Noise (S/N) squelch is based on the desired Audio S/N level. The Squelch Threshold setting in the MDT is used for both the RF signal level threshold (Carrier Squelch) and the audio signal-to-noise threshold (Noise Squelch). This is a value from 20 to 255 that corresponds to the threshold at which the audio circuits are enabled to allow audio signals to be routed to the REM INT connector, speaker, and headset. If using the Audio S/N Squelch mode, follow the procedures in 9.6.5.1. If using the Carrier Squelch mode, then follow the procedures in 9.6.5.2.

9.6.5.1 Set Audio S/N Squelch Threshold.

1. In the CM-300 UR Detail Window Front Panel tab, click on the box to the left of Carrier Squelch to set it on (box checked) (see Section 10.6.5.4.6).

2. In the CM-300 UR Detail Window Front Panel tab, click on the box to the left of Noise Squelch to set it on (box checked) (see Section 10.6.5.4.6).

NOTE

> To use signal to noise, squelch the carrier squelch must be on.

3. Use Figure 9-8 to determine the Audio S/N Squelch Break Threshold setting.

4. In the CM-300 UR Detail Window Front Panel tab, change the Squelch Threshold level by clicking on the up or down arrows on the right side of the Squelch Threshold (see Section 10.6.5.4.6).

NOTE

> The Squelch Threshold level can also be set using the CM-300 UR Radio Control Window (see Section 10.6.4.2).

5. Click on Apply (or OK) to apply the changes to the MDT (see Section 10.6.5.2.2).

Figure 9-8. Audio S/N (dB) Vs Squelch Threshold Setting (S/N Squelch Enabled, Carrier Squelch Enabled)

$$\boxed{\textbf{NOTE}}$$

The graph for the setting above is approximate. External test equipment should be used to verify the accuracy of settings.

9.6.5.2 Set Carrier Squelch Threshold.

1. In the CM-300 UR Detail Window Front Panel tab, click on the box to the left of Carrier Squelch to set it on (box checked) (see Section 10.6.5.4.6).

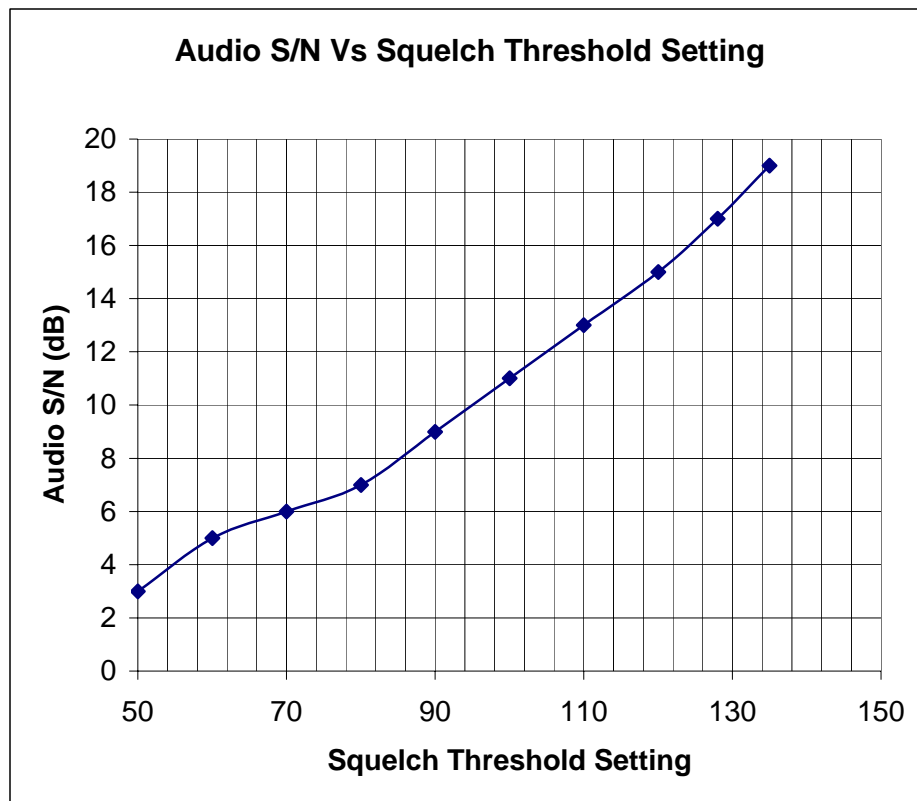2. Ensure the box next to Noise Squelch is unchecked (see Section 10.6.5.4.6).

3. Use Figure 9-9 to determine the Carrier Squelch Threshold setting.

4. In the CM-300 UR Detail Window Front Panel tab, change the Squelch Threshold level by clicking on the up or down arrows on the right side of the Squelch Threshold (see Section 10.6.5.4.6).

$$\boxed{\textbf{NOTE}}$$

The Squelch Threshold level can also be set using the CM-300 UR Radio Control Window (see Section 10.6.4.2).

5. Click on Apply (or OK) to apply the changes to the MDT (see Section 10.6.5.2.2).

Carrier Squelch Break Threshold Vs Squelch Threshold Setting
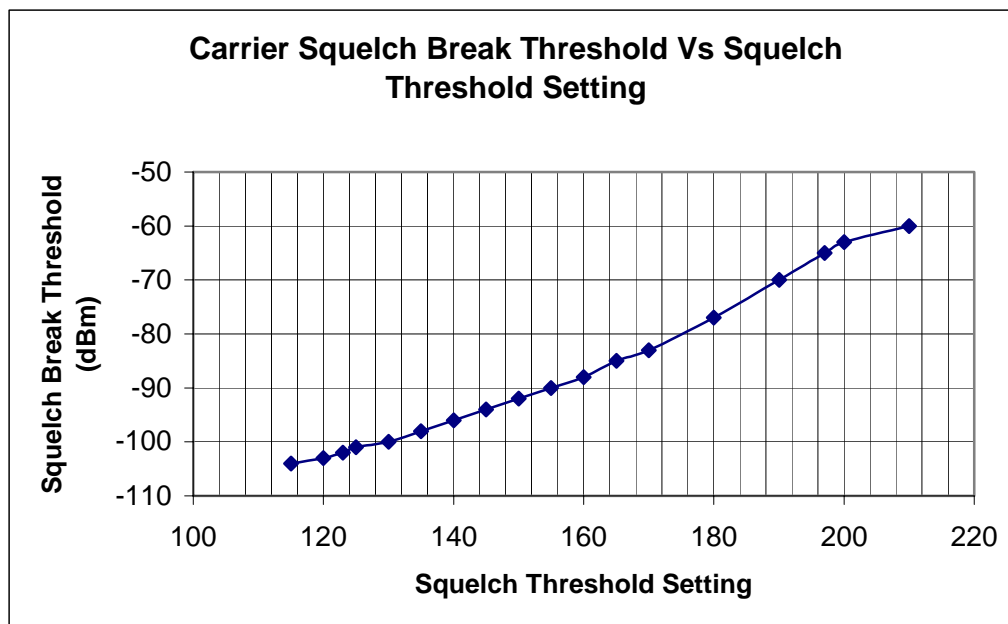
Figure 9-9. Squelch Break Threshold Vs Squelch Threshold Setting (S/N Squelch Disabled, Carrier Squelch Enabled)

$$\boxed{\textbf{NOTE}}$$

The graph for the setting above is approximate. External test equipment should be used to verify the accuracy of settings.

9.6.6 Check Squelch Action and Adjustment .-   Perform Squelch Action and Adjustment check using the procedure listed in Section 6.3.

9.6.7 Set Audio Level .- This procedure sets the volume level of the audio signal on the REM INT connector. The higher the setting, the higher the volume of the audio signal. The Factory Default setting is 008 (~ -8 dBm).

1.   In the CM-300 UR Detail Window Front Panel tab, change the audio level by clicking on the up or down arrows, on the right side of the Audio Level (see Section 10.6.5.4.7).

2.   Using Figure 9-10, set the Audio Level to the level prescribed by the standards and tolerances of Section 4.

3.   Click on Apply (or OK) to apply the changes to the MDT (see Section 10.6.5.2.2).

Figure 9-10. Audio Power Output 600 Ohm Vs Audio Threshold Setting

| NOTE |

The graph for the setting above is approximate. External test equipment should be used to verify the accuracy of settings.
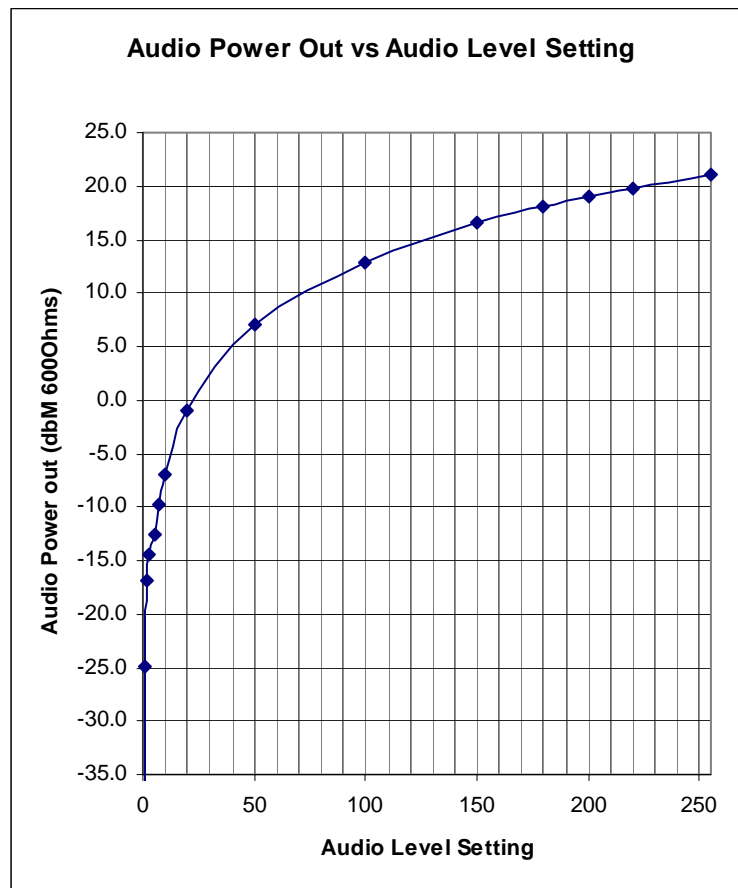
9.6.8 Audio Level .-   Perform Audio Level check using the procedure listed in Section 6.4.

9.6.9   Check Receiver Sensitivity.- Perform a Receiver Sensitivity Check using the procedure listed in Section 6.5.

SECTION 10
SOFTWARE

10.1 INTRODUCTION.- This section defines minimum system requirements for the MDT and describes the installation and operation of the UHF MDT Software.

10.2 MINIMUM SYSTEM REQUIREMENTS.- The MDT interface software can operate on industry standard laptop Personal Computers that, at a minimum, are configured with the following:

1) Windows 2000 or Windows NT Service Pack 6.0
2) 100 Mb of Hard Drive space for MDT software exclusive use
3) 32 Mb of RAM
4) 800x600x8 display
5) Pentium 200 processor
6) RS-232 serial interface using DB-9 connector
7) CD-ROM Drive
8) Single Standard High Density Floppy drive

10.3 MDT TO RADIO CONNECTION.- Connect the MDT to the radio front or rear panel MDT connectors (while the radio is installed in the rack, the front MDT connector may be more accessible). If the connector on the MDT cable is not compatible with the mating connector on the receiver, assemble the new connector and back shell (supplied with the receiver). Follow the assembly instructions in Section 9.3.5.

10.4 UHF MDT SOFTWARE INSTALLATION.-   The UHF MDT Software is available on CD ROM. See Table 1-5 for part number and NSN. For installation and initialization of the UHF MDT Software, follow the procedure below.

NOTE

The LongArm® Lite / CM-300 Radio Series Application software is referred to as the "UHF MDT Software" or just the "CM-300 Radio Series Application".

1. Insert the UHF MDT Software CD into the MDT CD drive. Installation should commence automatically.

2. If not, access the CD drive and double-click on Setup.exe file (Figure 10-1). This will run the Setup application.

NOTE

If this is the first installation, the first screen displayed is the Welcome to the InstallShield Wizard LongArm® Lite / CM-300 Radio Series window (Figure 10-6). Go to step 4.

If a previous version of the UHF MDT Software was installed, the first screen displayed is the Welcome window (Figure 10-2). Go to step 3 to uninstall the previous version, repeat step 2, and then go to step 4.
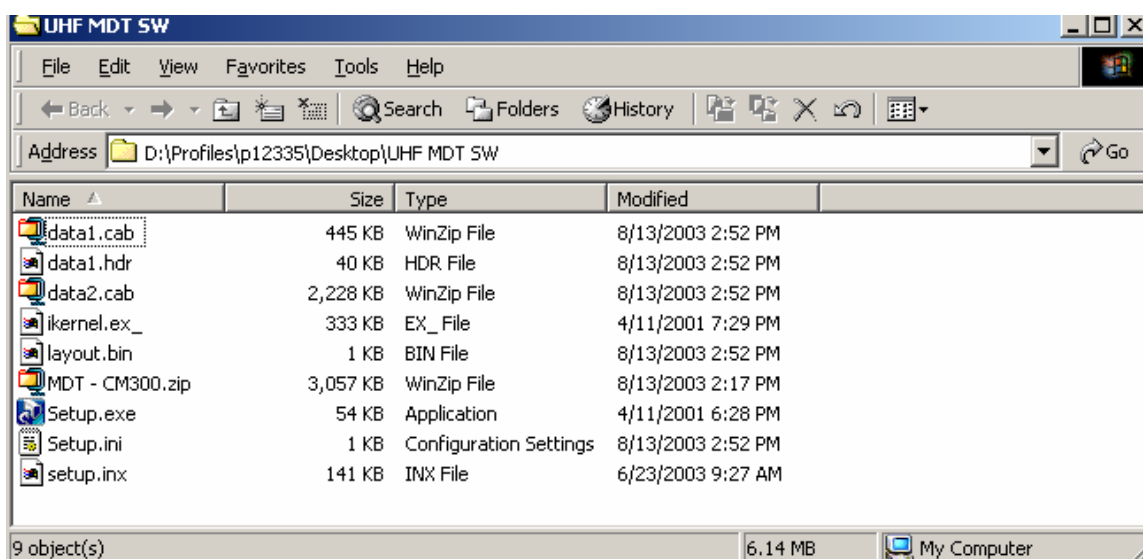
Figure 10-1. UHF MDT Software Setup Files

3. Uninstall previous version of the UHF MDT Software as follows:

   a. On the Welcome window (Figure 10-2) select the Remove button and click Next. The Confirm File Deletion dialog box is displayed.
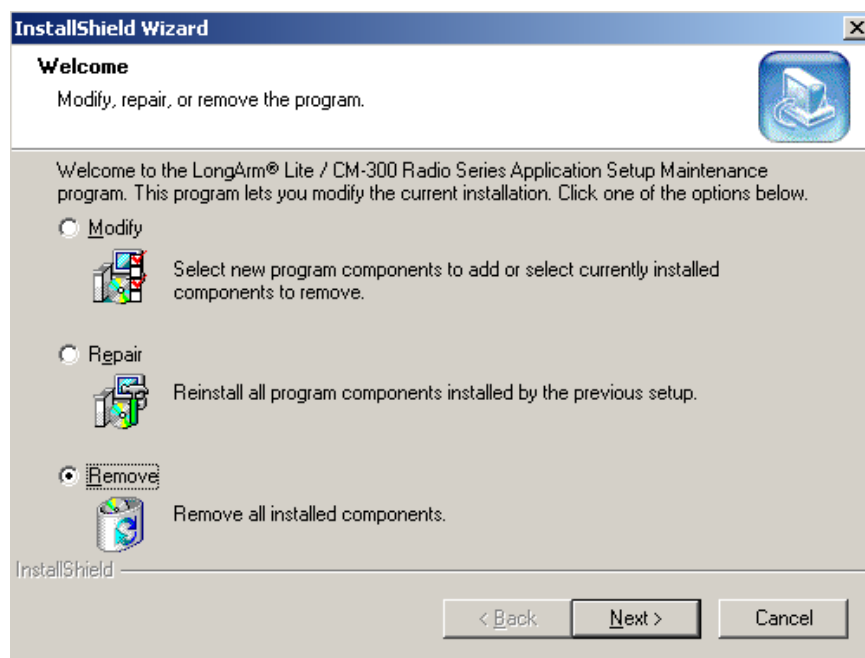
Figure 10-2. Welcome, Window

b. On the Confirm File Deletion dialog box (Figure 10-3), click OK. The ReadOnly File Detected dialog box is displayed.
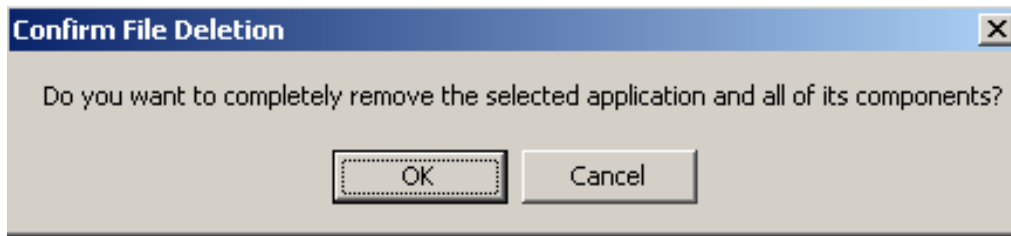
Figure 10-3. Confirm File Deletion, Dialog Box

c. On the ReadOnly File Detected dialog box (Figure 10-4), click Yes. The Maintenance Complete window is displayed.
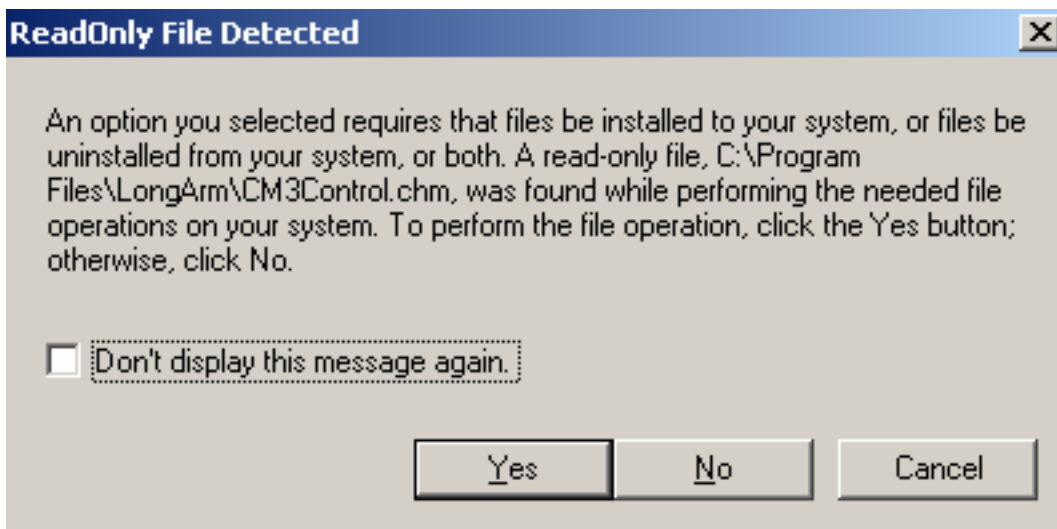
Figure 10-4. Confirm ReadOnly File Deletion, Dialog Box

d. On the Maintenance Complete window (Figure 10-5), click Finish. This will complete the uninstallation.
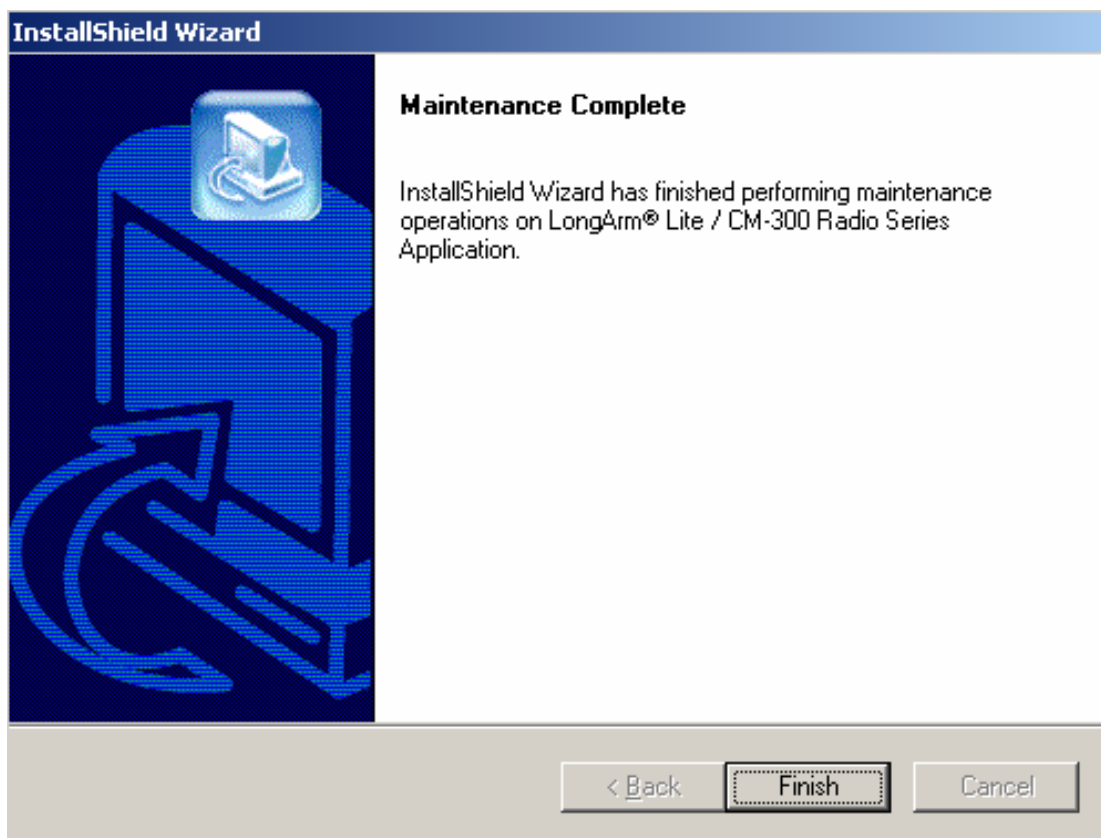
Figure 10-5. Maintenance Complete, Window

e. Go back to step 2 and double-click on Setup.exe. The Welcome to the InstallShield Wizard LongArm® Lite / CM-300 Radio Series window is displayed (Figure 10-6).

4. The InstallShield Wizard LongArm® Lite / CM-300 Radio Series window (Figure 10-6) is the Installation Wizard for CM-300 Radio Series Applications. Click on Next to proceed with the installation. The Choose Destination Location window is displayed.

Figure 10-6. InstallShield Wizard for CM-300 Radio Series, Window

5. On the Choose Destination Location window (Figure 10-7), click on Next. The Select Program Folder window is displayed.
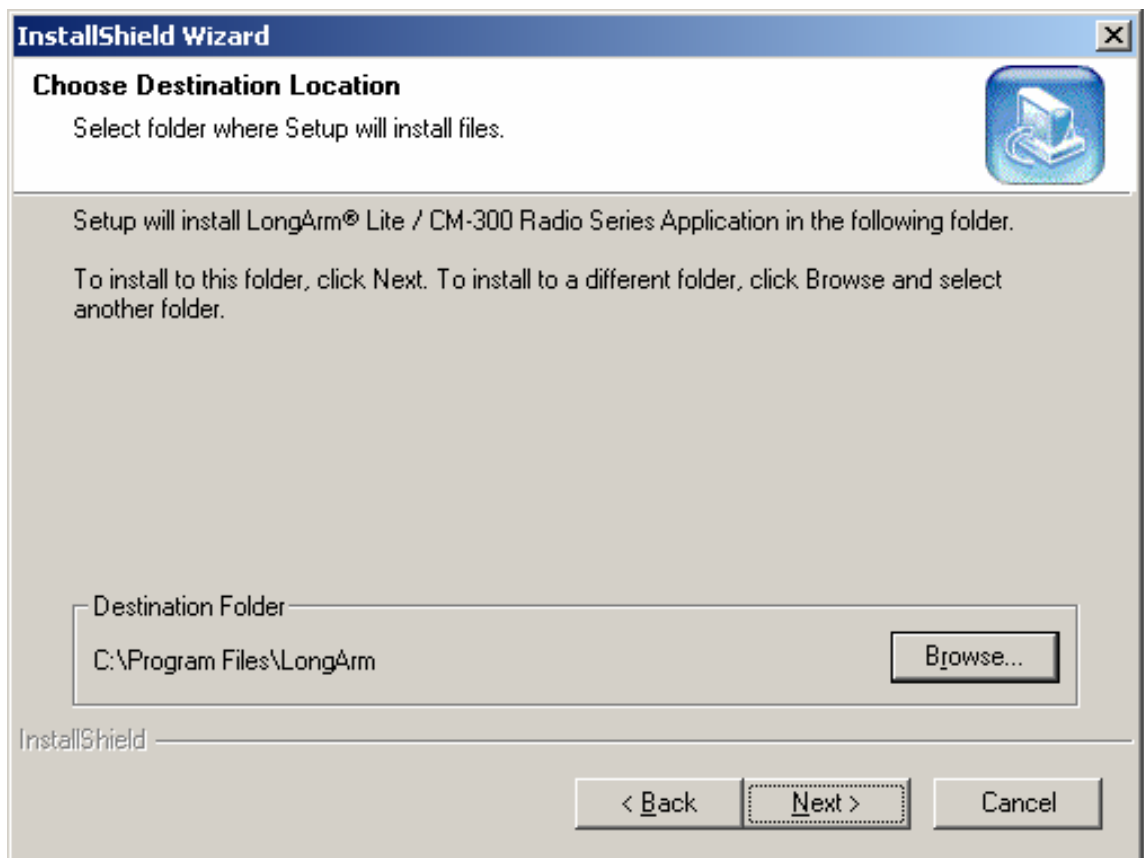
Figure 10-7. Choose Destination Location, Window

6. On the Select Program Folder window (Figure 10-8), click on Next. The Start Copying Files window is displayed.
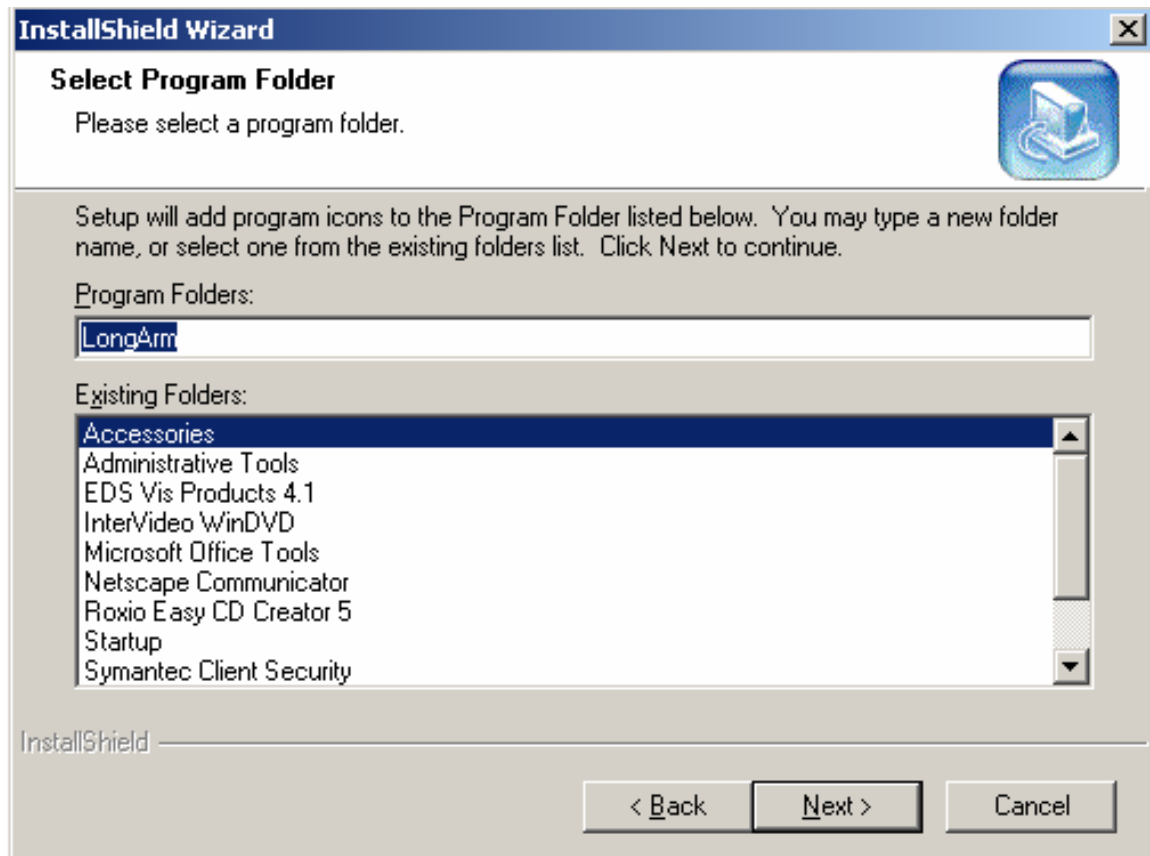
Figure 10-8. Select Program Folder, Window

7. On the Start Copying Files window (Figure 10-9), click on Next. The files are copied to the location specified in step 5 and the InstallShield Wizard Complete window is displayed.
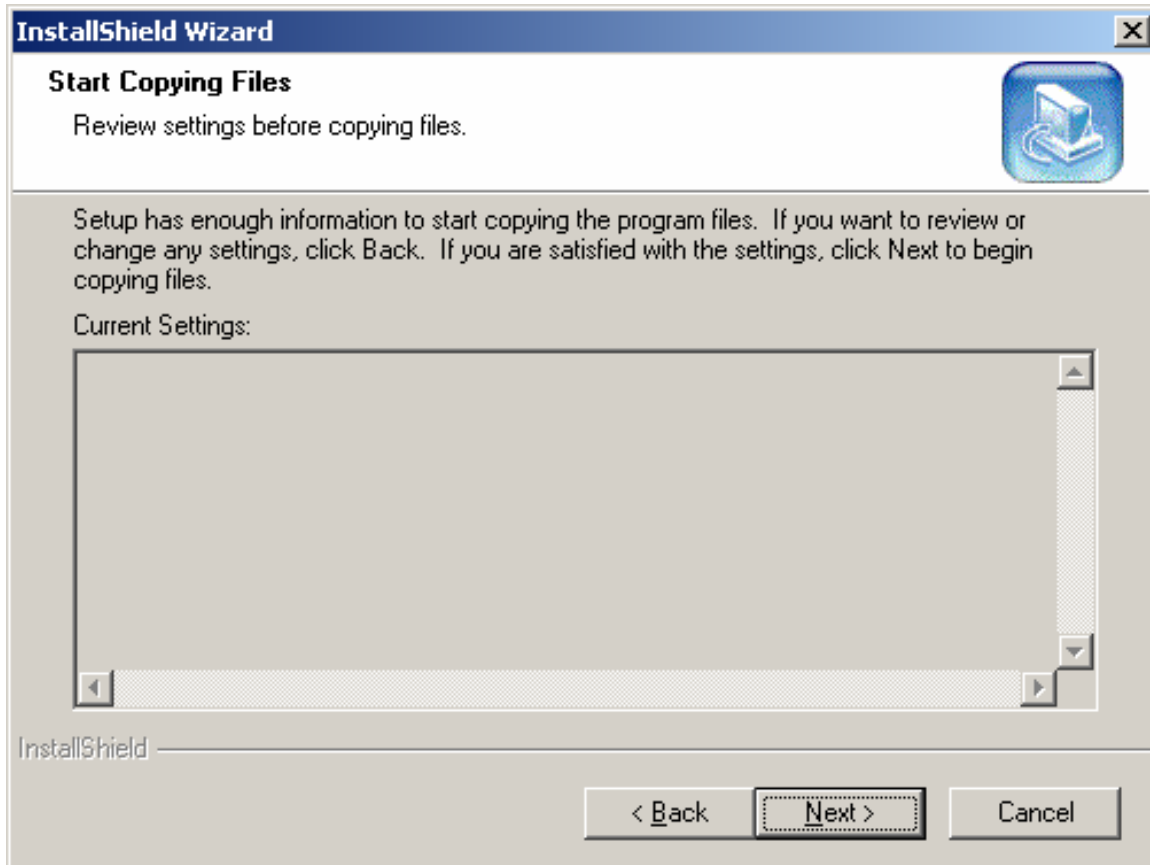
Figure 10-9. Start Copying Files, Window
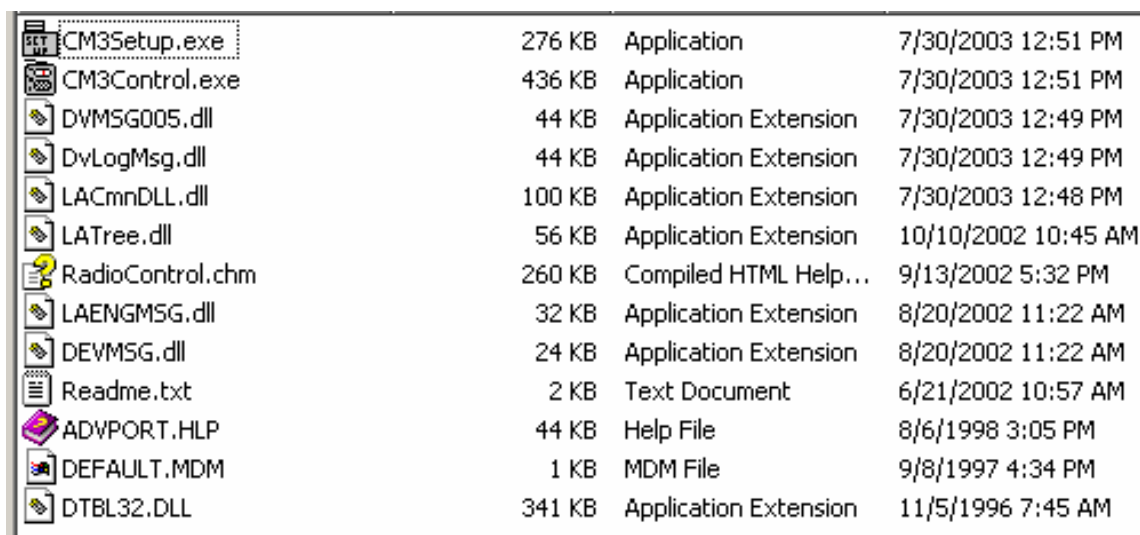
8. On the InstallShield Wizard Complete window (Figure 10-10), click on Finish. The installation is completed and the CM-300 Radio Series Setup window is displayed. A Readme.txt-Notepad is also displayed providing instructions for using the basic features of the CM-300 Radio Series Application Software.

InstallShield Wizard

InstallShield Wizard Complete

Setup has finished installing LongArm® Lite / CM-300 Radio Series Application on your computer.

< Back   Finish   Cancel
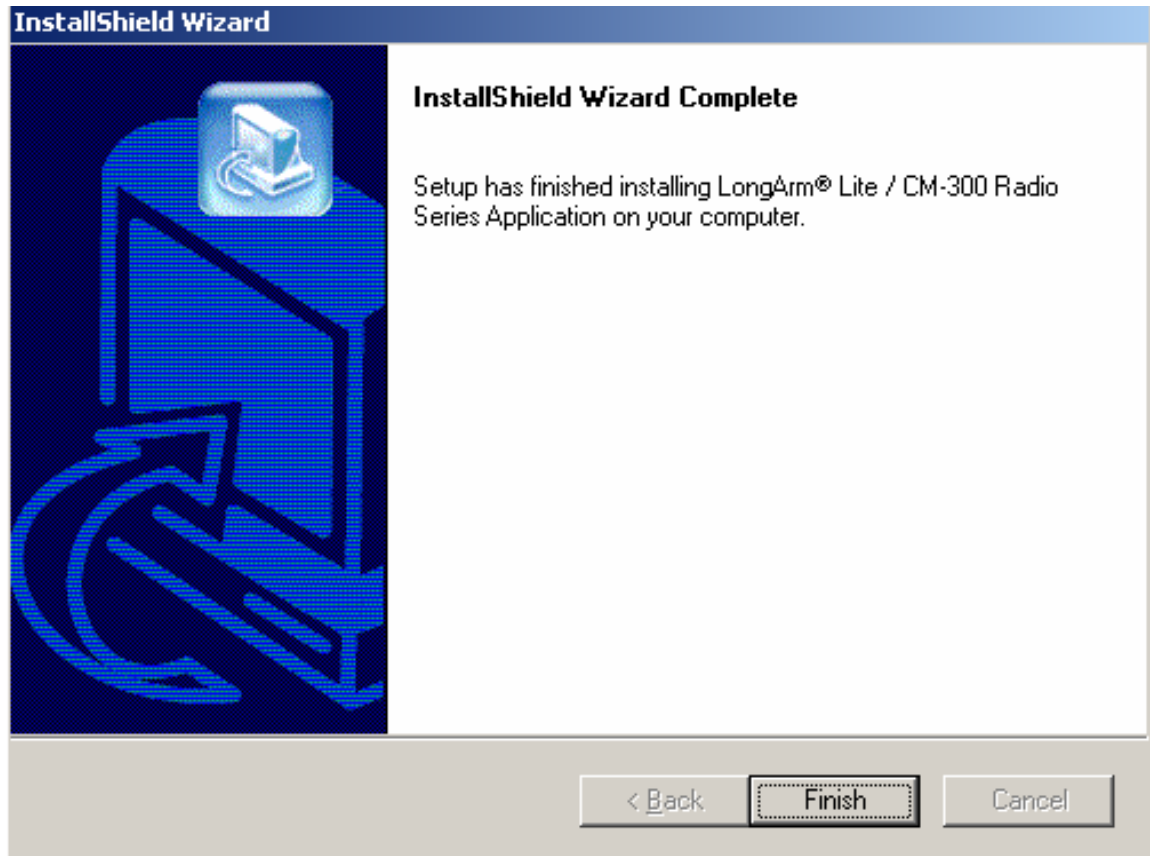
Figure 10-10. InstallShield Wizard Complete, Window

NOTE

Once the installation is complete, the CM-300 Radio Series Application Software files are stored in the location specified in step 5 (Figure 10-11). Executing the **CM3Setup.exe** application will open the CM-300 Radio Series Setup window (Figure 10-12). Executing the **CM3Control.exe** application will open the Radio Control window (Figure 10-17). However, normal access to the software will usually be done through the Start menu (see Section 10.5)

CM3Setup.exe	276 KB	Application	7/30/2003 12:51 PM
CM3Control.exe	436 KB	Application	7/30/2003 12:51 PM
DVMSG005.dll	44 KB	Application Extension	7/30/2003 12:49 PM
DvLogMsg.dll	44 KB	Application Extension	7/30/2003 12:49 PM
LACmnDLL.dll	100 KB	Application Extension	7/30/2003 12:48 PM
LATree.dll	56 KB	Application Extension	10/10/2002 10:45 AM
RadioControl.chm	260 KB	Compiled HTML Help…	9/13/2002 5:32 PM
LAENGMSG.dll	32 KB	Application Extension	8/20/2002 11:22 AM
DEVMSG.dll	24 KB	Application Extension	8/20/2002 11:22 AM
Readme.txt	2 KB	Text Document	6/21/2002 10:57 AM
ADVPORT.HLP	44 KB	Help File	8/6/1998 3:05 PM
DEFAULT.MDM	1 KB	MDM File	9/8/1997 4:34 PM
DTBL32.DLL	341 KB	Application Extension	11/5/1996 7:45 AM

Figure 10-11. CM-300 Radio Series Application Software Files

10.5 <u>ACCESSING THE UHF MDT SOFTWARE</u>.- After the UHF MDT Software has been installed, it can be accessed through the Start menu :

Start/Programs/LongArm/ CM-300 Radio Series Setup

Create a shortcut on the desktop:

1. Right-click on **CM-300 Radio Series Setup** and select Create Shortcut
2. Drag and drop the created shortcut to your desktop
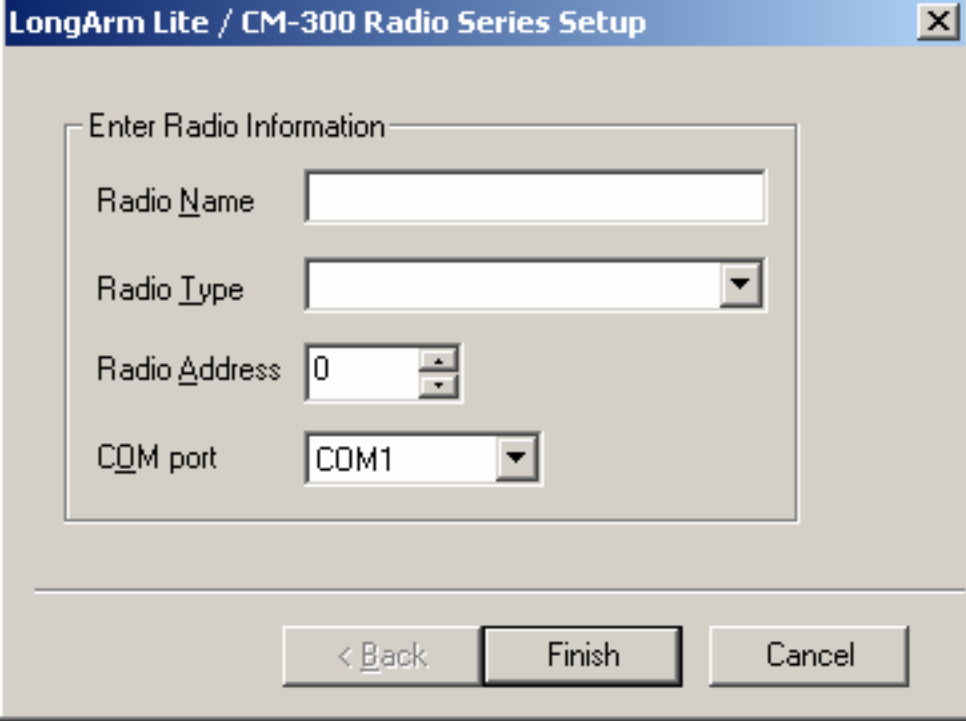
On the **CM-300 Radio Series Setup** window, select the receiver from the Radio Type box (see Section 10.6.1).

10.6 <u>UHF MDT SOFTWARE OPERATION</u>.- The UHF MDT Software facilitates the CM-300 Radio Series Graphic User Interface (GUI). The GUI provides the user interface necessary to control and monitor the CM-300 UHF receiver, the CM-300 UHF transmitter and CM-350 UHF transmitter. The CM-300 Radio Series GUI consists of the:

- CM-300 Radio Series Setup window (used to configure each radio) and the

- CM-300 UR Detail window (used to monitor/control each radio)

10.6.1 CM-300 Radio Series Setup Window .- This window is used as a configuration dialog for all CM-300 series radio types. The CM-300 Radio Series Setup window is shown in Figure 10-12 and its controls are described in Table 10-1. Detailed descriptions of operational procedures are provided in Section 10.6.2.

Figure 10-12. CM-300 Radio Series Setup, Window

Table 10-1. CM-300 Radio Series Setup Window Controls
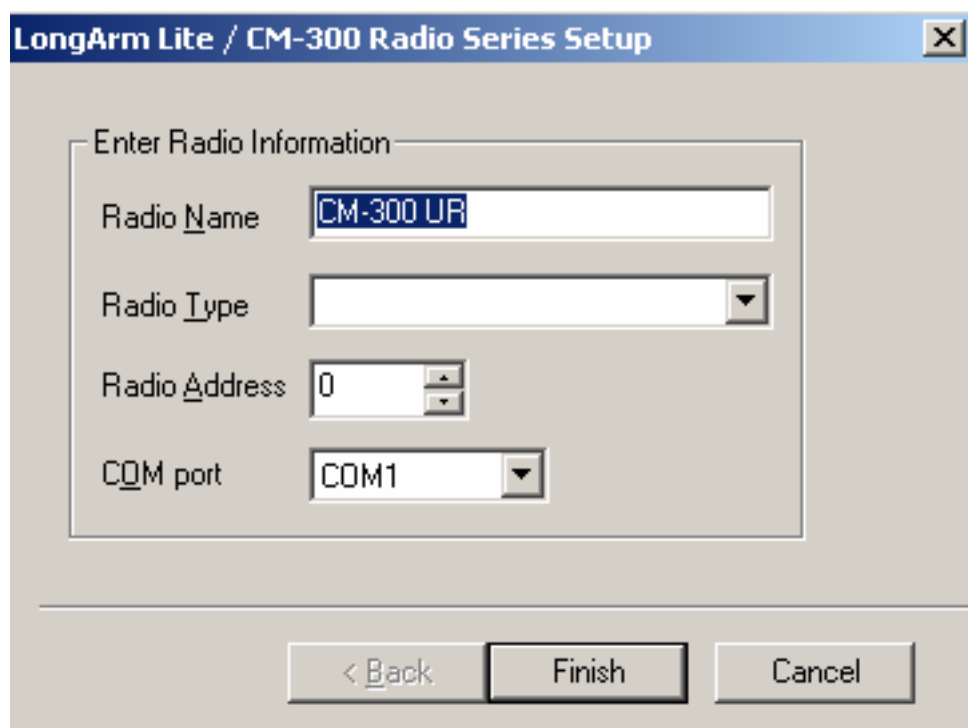
Name	Limits	Control	Execution	Description
Radio Name	25 Alpha-numeric characters	Edit box	Selection of Finish	Enter the name of the radio here.
Radio Type	"CM-300 UHF Receiver", "CM-300 UHF Transmitter", or "CM-350 UHF Transmitter"	Drop-down list box	Selection of Finish	Enter the radio type here.
Radio Address	"0" to "15"	Edit box and spin control	Selection of Finish	Enter the radio address here. Must be the correct address or radio may not be accessed. Currently default address is 15 as only one radio is configured per MDT.
COM Port	All available COM ports	Drop-down list box	Selection of Finish	Select a COM port here. This depends on how many ports are available on the user's PC and which port is being used.
Back	N/A	Button	Immediate	Go to previous page. This button is always disabled as only one radio is configured per MDT.
Finish	N/A	Button	Immediate	Apply changes.
Cancel	N/A	Button	Immediate	Discard changes and exit dialog.

10.6.2 CM-300 Radio Series Setup Window Operation.- This window is used to configure the radio which is to be monitored/controlled. It sets the radio name, radio type, radio address, and COM port. It generates a unique identity for each radio, enabling the operator to call up the required radio as needed. The procedures to do this are described below.

> **NOTE**
>
> Currently, only one radio is configured per MDT. The same procedures may be used for either a CM-300 UHF Receiver, a CM-300 UHF Transmitter, or a CM-350 UHF Transmitter.

1.   Set Radio Name - On the CM-300 Radio Series Setup window, in the Radio Name field, enter the radio name. This entry may be as many as 25 alpha-numeric characters long. e.g. CM-300 UR, or CM-300 UT, or CM-350 UT (Figure 10-13).

Figure 10-13. Set Radio Name, Screen

2. Set Radio Type - On the CM-300 Radio Series Setup window, click on the down arrow of the Radio Type pulldown list and select CM-300 UHF Receiver, or CM-300 UHF Transmitter, or CM-350 UHF Transmitter (Figure 10-14).
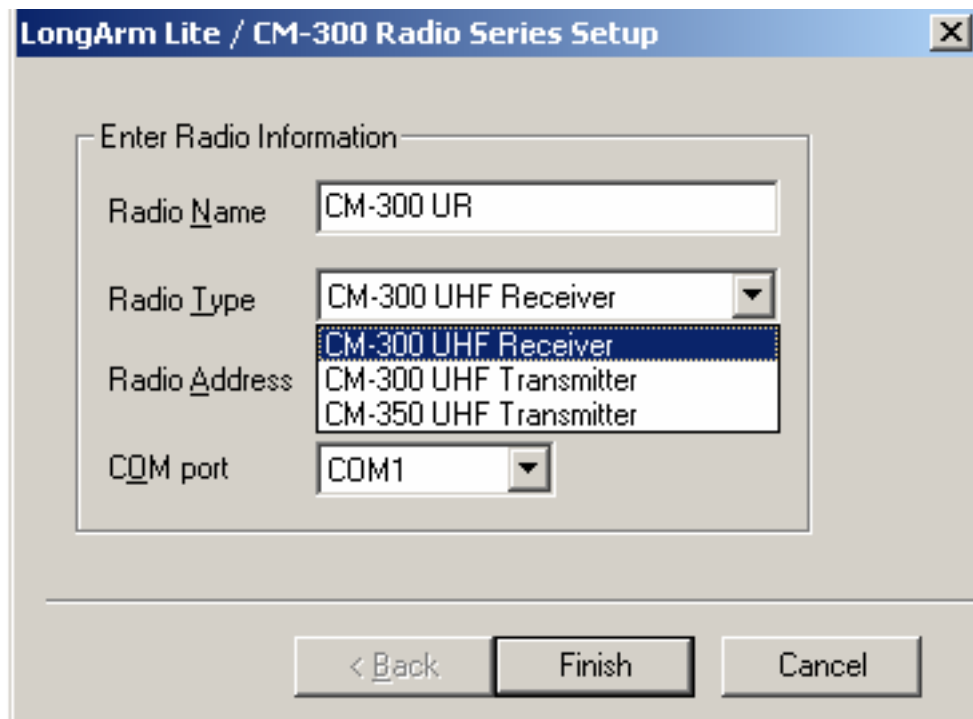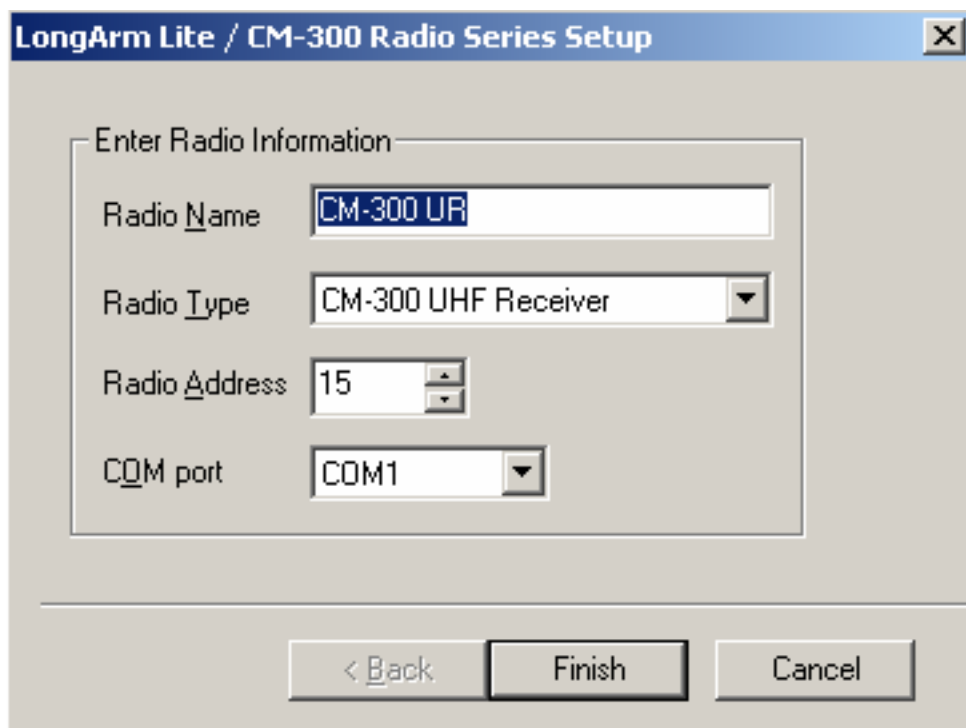
Figure 10-14. Set Radio Type, Screen

3. Set Radio Address - On the CM-300 Radio Series Setup window, use up/down arrows to select address 15 (Figure 10-15).

$$\boxed{\textbf{NOTE}}$$

It is important that the correct address is entered. If the correct address is not entered, the MDT will be unable to access the radio. The radio address of each radio is hardwired at the REM INT connector and it can be a number from 0 through 15. However, currently, only one radio is configured per MDT and the default address setting at the REM INT connector is 15 (see section 9.6.1).

Figure 10-15. Set Radio Address, Screen

4. Select a COM Port - On the CM-300 Radio Series Setup window, click on the down arrow of the COM port pulldown list and select port (Figure 10-16).

NOTE

It is important that the correct COM port is entered. If the correct COM port is not entered, the MDT will be unable to access the radio. This depends on how many ports are available on the user's MDT and which port is being used.
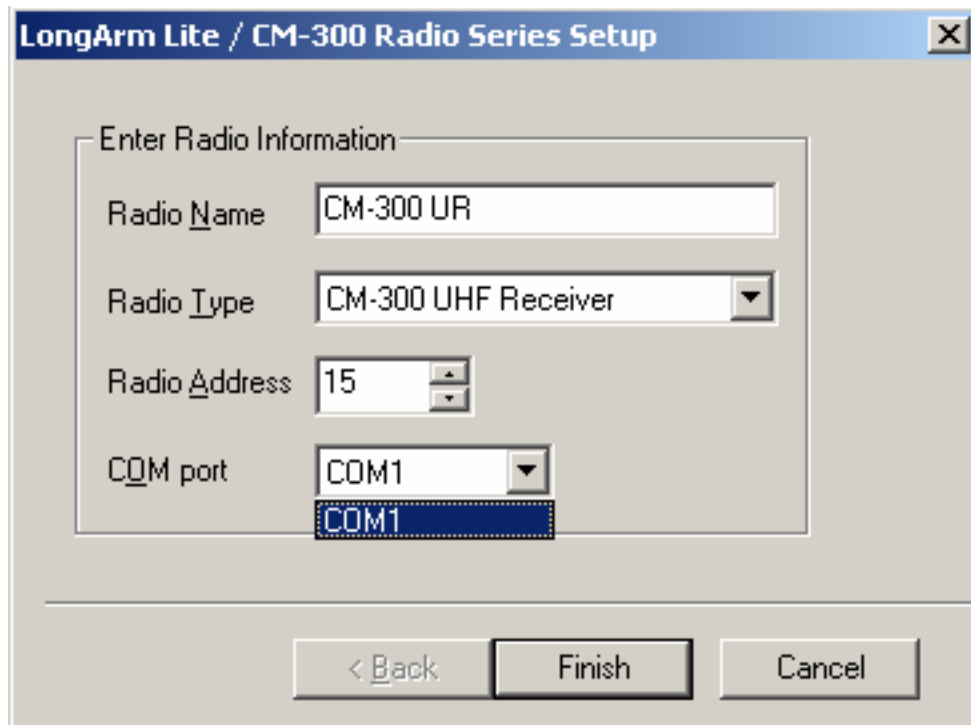
Figure 10-16. Set COM Port, Screen

5. Click on Finish to apply all the settings. This will complete the radio setup process and will display the Radio Control window (Figure 10-17) for the radio that has been configured. i.e. for CM-300 UHF Receiver, or CM-300 UHF Transmitter, or CM-350 UHF Transmitter. This window will have a title of "Default.rcg – Radio Control (Lite)"

6. Save settings for each radio configured by doing a "Save As" in the Radio Control window displayed.

   a. Pull down the File menu, select Save As.
   b. In the Save As dialog box, enter the desired file name e.g. CM-300 UR. This will rename the Radio Control window from "Default.rcg – Radio Control (Lite)" to "CM-300 UR.rcg – Radio Control (Lite)".

10.6.3 CM-300 Radio Series Radio Control Window.- The Radio Control window is displayed after configuration has been completed (see Section 10.6.2). The Radio Control application is used to monitor and control the radios' "common" fields. These fields are: Frequency, Channel, Mode, Power State, Squelch, AGC, Gain, BW, AFB, Tx Power Level, Status, and Owner. For the CM-300 UR, only Frequency and Squelch are available. For the CM-300 UT and CM-350 UT radios, only Frequency and Tx Power Level are available. The CM-300 Radio Series Radio Control window is shown in Figure 10-17, and its controls are described in Table 10-2.

The Radio Control screen currently has limited application, but will be further utilized in future enhancements. The software is based on the LongArm software and includes the same structure, much of which is not utilized.

The parameters that are shown on this screen can be changed. Either right-click on the parameter or left-click and hit the ENTER key to change the parameter. If the device does not support frequency, channel, mode, power, squelch, AGC, Gain, BW, AFB, or Tx Pwr, the corresponding cell for that device is left blank. The dialog will not pop-up when user right-clicks or selects and presses Enter on the cell. The user can collapse the not supported cells.

The Detail window is invoked from the Radio Control window in several ways (see Section 10.6.4.3).
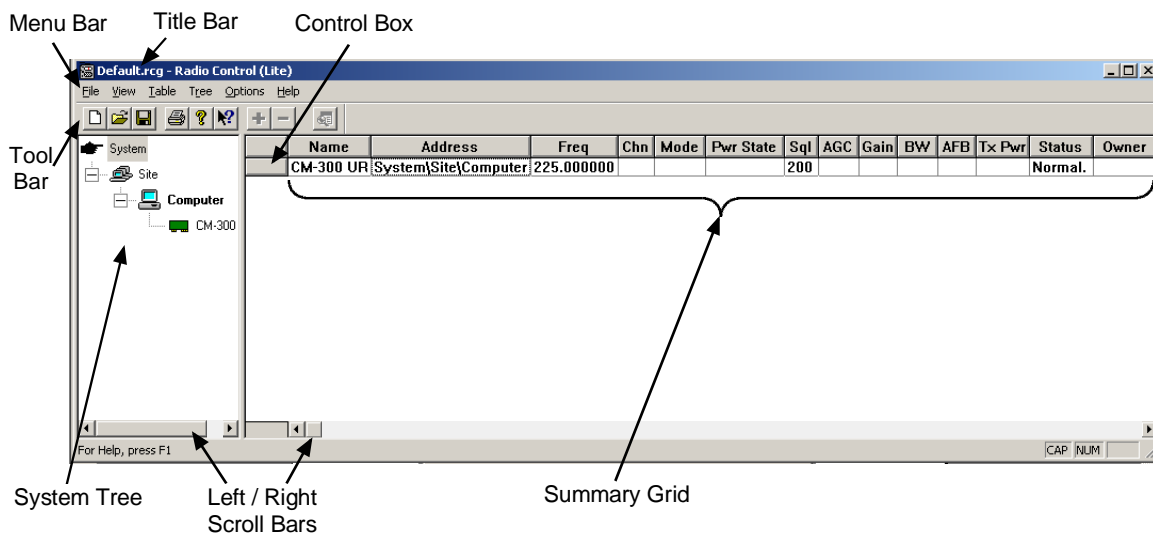
Figure 10-17. CM-300 Radio Series Radio Control, Window

Table 10-2. CM-300 Radio Series Radio Control Window Controls

Control			Description
Menu Bar	File	New	Creates a new .rcg file.
		Open	Opens an existing .rcg file.
		Save	Saves configuration to existing .rcg file.
		Save As	Save configuration to a user-defined .rcg file.
		Print	Prints the Name, Address, Frequency, and Status of monitored radio.
		Print Setup	For future use.
		Exit	Exit MDT software.
	View	Toolbar	Shows/Hides the shortcut icons near top of screen.
		Status Bar	Shows/Hides the status bar at bottom of screen.
		Split	Allows for sizing adjustments to the two portions of the screen.
		Detail Page	Opens Detail window for the radio selected; same function as Detail Page icon. To activate this control, select the radio icon on the System Tree or select the Summary Grid.
	Table	No Sort	For future use.
		Ascending Sort	For future use.
		Descending Sort	For future use.
		Sort by	For future use.
	Tree	Add Radio to Grid	For future use. To activate this control, select the radio icon on the System Tree.
	Options	Set Font	Changes font characteristics.
		Save Settings on Exit	Enable/Disable saving settings on exit.
		Save Settings Now	Save settings now.

Table 10-2. CM-300 Radio Series Radio Control Window Controls (Contd)

| Control			Description
Menu Bar (Contd)	Help	Contents	Guide to using the LongArm Lite / CM-300 Series Radio Application.
		About Radio Control	Version and copyright information.
Tool Bar	In the Tool Bar, place the cursor over the icon to display its name. These icons duplicate the functionality of the controls in the Menu Bar.		
	New		Creates a new .rcg file.
	Open		Opens an existing .rcg file.
	Save		Saves configuration to existing .rcg file.
	Print		Prints the Name, Address, Frequency, and Status of monitored radio.
	About		Version and copyright information.
	Help		Guide to using the LongArm Lite / CM-300 Series Radio Application.
	Add Row		Adds Summary Grid row. To activate this icon, select the radio on the System Tree.
	Delete Row		Deletes Summary Grid row. To activate this icon, click on the Control Box to select the Summary Grid.
	Detail Page		Opens Detail window for the radio selected. To activate this icon, select the radio on the System Tree or select the Summary Grid.
Control Box			Selects Summary Grid.

10.6.4 CM-300 Radio Series Radio Control Window Operation.- The Radio Control window is the first screen invoked for the monitoring and control of a radio. It displays the system tree, the name of the radio, the frequency and squelch settings, and the status of the radio. From this screen, you may edit the frequency and squelch settings or invoke the radio's Detail Window.

10.6.4.1 Set Operating Frequency Using the Radio Control Window.- This procedure sets the radio's operating frequency.

> **NOTE**
>
> The operating frequency may also be set through the Detail Window Front Panel Tab (see Section 10.6.5.4.1).

1.   On the Radio Control window, right-click on the Freq cell or select the Freq cell and press Enter. The Frequency [MHz] dialog box is displayed (Figure 10-18).

2.   On the Frequency [MHz] dialog box, set frequency as required

3.   Click on OK to apply the change.
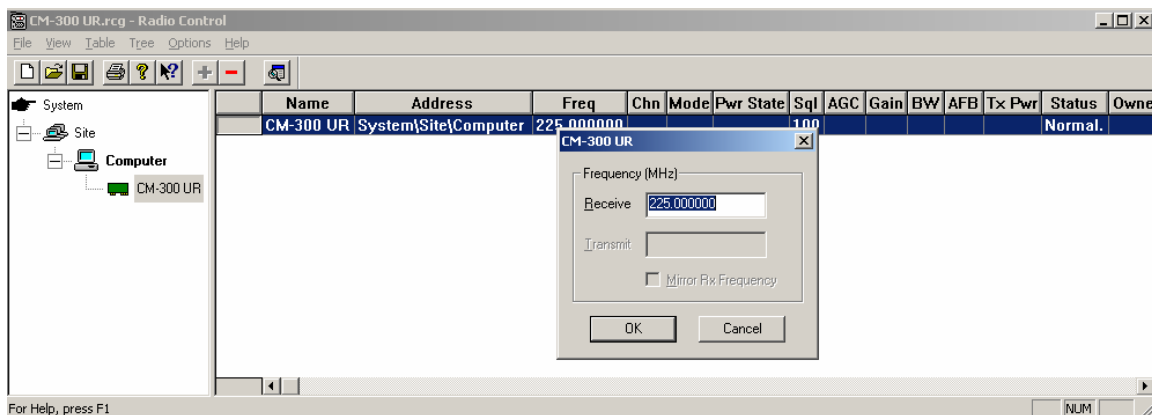
Figure 10-18. Radio Control Window – Frequency Dialog Box

10.6.4.2 Set Squelch Threshold Using the Radio Control Window.- This procedure sets the squelch threshold level.

> **NOTE**
>
> The squelch threshold may also be set through the Detail Window Front Panel Tab (see Section 10.6.5.4.6).

1.   On the Radio Control window, right-click on the Sql cell or select the Sql cell and press Enter. The Squelch dialog box is displayed (Figure 10-19).

2.   On the Squelch dialog box, use up and down arrows to select squelch setting.

3.   Click on OK to apply the change.
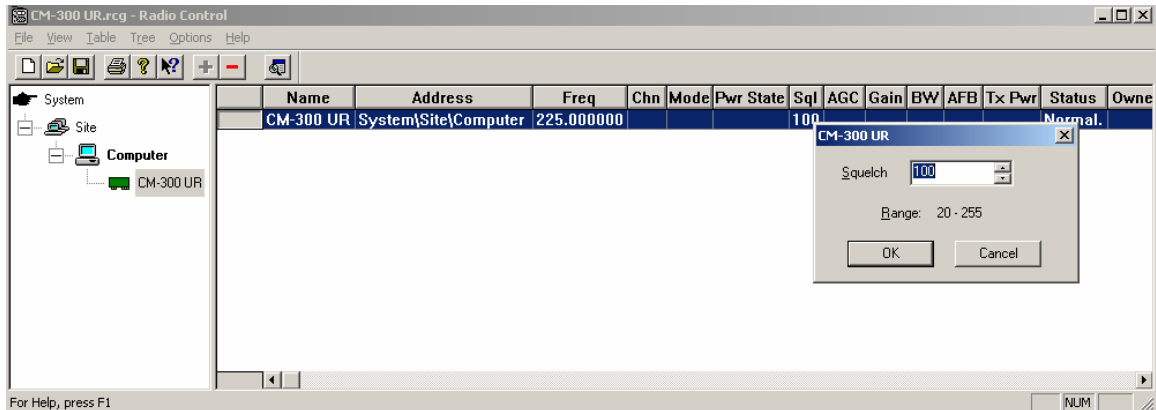
Figure 10-19. Radio Control Window - Squelch Dialog Box

10.6.4.3   Invoke CM-300 UR Detail Window.-   Detailed monitoring and control of radios is facilitated by the radio's Detail Window (see Section 10.6.5). This window can be invoked from the Radio Control window in several ways:

- Double-click anywhere in the Summary Grid.

- Click on the radio icon to highlight the radio in the System Tree. Click on the Detail Page icon in the tool bar or select View, then Detail Page in the menu bar**.**

- Click on the Control Box to the left of the radio's row to highlight the radio's Summary Grid. Click on the Detail Page icon in the tool bar, or select View then Detail Page in the menu bar**.**

10.6.5 CM-300 UR Detail Window.- Detailed monitoring and control of radios is done from the CM-300 UR Detail window. This window is invoked via the Radio Control application (see Section 10.6.4.3).

The CM-300 UR Detail window contains two tabs (Figure 10-20):

- Front Panel tab

- Maintenance tab
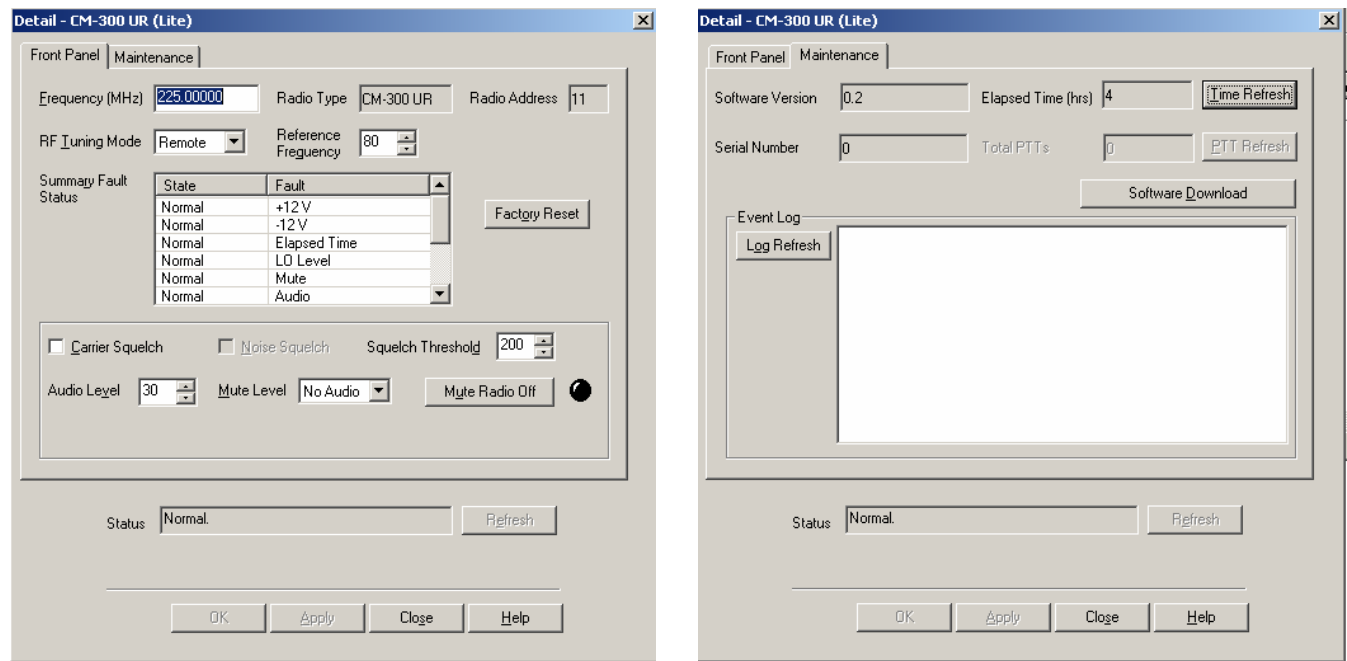
Front Panel Tab   Maintenance Tab

Figure 10-20. Front Panel Tab and Maintenance Tab

10.6.5.1 CM-300 UR Detail Window Common Controls.- The following controls are common to both the Front Panel and Maintenance tabs. Their operation is described first. See Tables 10-3 and 10-4, and Section 10.6.5.2.

Table 10-3. Common Controls Functionality

Control	Function
Status	Same for both the Front Panel tab and Maintenance tab.
Refresh, OK, Apply	Activated only in Editing Mode. Deactivated in Maintenance tab unless Editing Mode is entered through the Front Panel tab.
Close	Same for both the Front Panel tab and Maintenance tab.
Help	Same for both the Front Panel tab and Maintenance tab.
Editing Mode	Can only be entered through the Front Panel tab. Activates Refresh, OK, and Apply.
Queuing Device Mode	Same for both the Front Panel tab and Maintenance tab.
Changes Pending Mode	Same for both the Front Panel tab and Maintenance tab.

Table 10-4. CM-300 UR Detail Window Common Controls

Name	Limits	Control	Execution	Description
Status	Text	Static text control	N/A	Current status of radio. This will reflect the most critical status reported in the Summary Fault Status list. This status is also displayed in the Radio Control window. Currently the following statuses are displayed: **"Normal."** – MDT is able to communicate with radio and the highest Alarm/Alert state is "Normal". **"Alert."** – MDT is able to communicate with radio and the highest Alarm/Alert state is "Alert". **"Alarm."** – MDT is able to communicate with radio and the highest Alarm/Alert state is "Alarm". **"Failure."** – MDT is able to communicate with radio and the highest Alarm/Alert state is "Failure". **"Failed."** – MDT is unable to communicate with radio. **"Initializing."** – MDT is busy querying radio for its parameters. This status will be displayed when the radio is configured for the very first time; and when status changes from "Failed". **"Downloading software."** – MDT is busy downloading software to the radio.
Refresh	N/A	Button	Immediate	Enabled only when in "Editing Mode" and new radio settings are received. Refresh radio settings. When the Refresh button is clicked, a confirmation dialog is displayed. Click Yes - All changes will be lost and radio settings, as of the last Apply, will be restored. Click No - Changes will not be lost and may continue editing radio settings.
OK	N/A	Button	Immediate	Enabled only when in "Editing Mode". Apply radio settings then close dialog. Click on the OK button to apply all changed radio parameters to the MDT. All controls but the Close and the Help button will be grayed out while the GUI is waiting for the response from the MDT. The detail dialog will close upon receiving a successful response from the MDT. Essentially, the OK button is a combination of the Apply and Close buttons. Error checking is applied when the OK button is clicked.

Table 10-4. CM-300 UR Detail Window Common Controls (Contd)

Name	Limits	Control	Execution	Description
Apply	N/A	Button	Immediate	Enabled only when in "Editing Mode". Apply all changed radio parameters to the MDT. All controls but the Close button will be grayed out while the GUI is waiting for the response from the radio. The detail dialog will not close upon receiving a successful response from the driver. Error checking is applied when the Apply button is clicked.
Close	N/A	Button	Immediate	In the editing mode, when the Close button is clicked, a confirmation dialog is displayed. Click Yes - Discard all changes and close dialog. Click No - Return to detail dialog. If not in the editing mode, the detail window closes immediately when the Close button is clicked on.
Help	N/A	Button	Immediate	Display help for detail page.
At the bottom of the detail page, just below the Apply button, is the Detail Page mode indicator. Text is displayed in this area whenever the Detail Page is in a special mode. The following is a description of the possible detail page modes:				
Querying Device...:	N/A	Display	N/A	When the detail page is first opened, it sends query messages to the radio asking for current radio parameters. While waiting for responses from the radio, all controls but the Close button are grayed out. Once responses are received, radio parameters are displayed and the detail page goes out of this mode.
Editing Mode:	N/A	Display	N/A	The detail page goes into editing mode whenever the user begins entering in new values for the radio parameters. When the detail page goes into this mode, the Apply and OK buttons are enabled so the user can "apply" the changes.
Changes Pending...:	N/A	Display	N/A	The detail page goes into this mode when the Apply button is clicked. This is an indication that the detail page is waiting for responses from the MDT while it's applying changes to the radio. While in this mode, all controls but the Close button are grayed out.

10.6.5.2 CM-300 UR Detail Window Common Controls Operation.- This section provides detailed descriptions for procedures that may be executed using the CM-300 UR Detail window common controls. These procedures are the same for both the Front Panel tab and the Maintenance tab. The following procedures are provided:
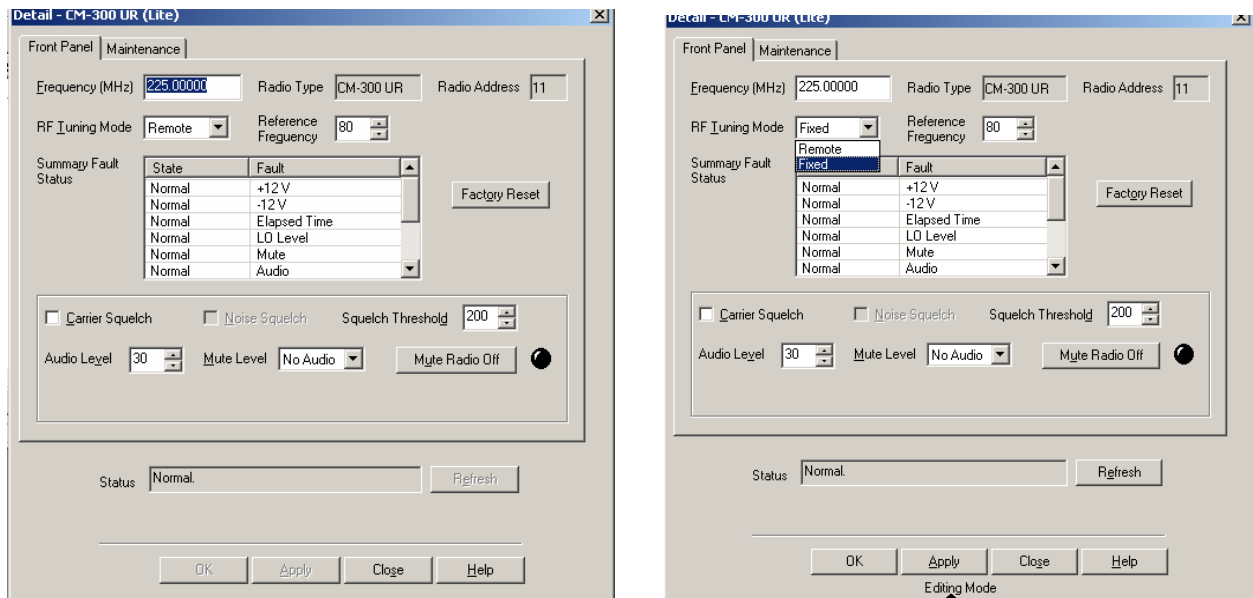
- Enter Editing Mode
- Apply Changed Radio Parameters to the MDT
- Refresh Radio Settings

10.6.5.2.1 Enter Editing Mode.- This procedure provides instructions on how to enter the editing mode and proceed to monitor/control radio parameters.

NOTE

In the Maintenance tab, the Refresh, OK, and Apply buttons are normally grayed out. The editing mode can only be entered through the Front Panel tab.

1.   On the CM-300 UR Detail window, open the Front Panel tab.

2.   Before you start entering data, the Front Panel tab will display the factory default settings or the latest settings (since the last Apply). The Refresh, OK, and Apply buttons will be deactivated (grayed out). See Figure 10-21.

3.   Begin to enter data (e.g. change the RF Tuning Mode).

4.   The Refresh, OK, and Apply buttons are activated and Editing Mode is displayed just below the Apply button (Figure 10-21).

Figure 10-21. Enter Editing Mode, Screen

10.6.5.2.2 Apply Changed Radio Parameters to the MDT.- This is the process by which new radio parameters are applied to the MDT. In this procedure, either the Apply button or the OK button may be used. If the Apply button is used, the detail dialog will not close upon receiving a successful response from the MDT. If the OK button is used, the detail dialog will close upon receiving a successful response from the MDT (a combination of Apply and Close).

$$\boxed{\textbf{NOTE}}$$

Error checking is applied when the OK or Apply button is clicked. There is minimal error checking when each input field is being edited. For example, input fields that require numerical values will not accept alpha characters. Input values are then validated against actual ranges/limits when they are about to be applied to the MDT.

When using the UHF MDT Software to make changes to the radio parameters, change one parameter at a time. Click on Apply (or OK) to apply the change before proceeding with further changes.

1.   In the Front Panel tab, enter desired changes.
2.   Click on Apply (or OK).
3.   All controls but the Close button will be grayed out (if OK is used, all controls but the Close and Help buttons will be grayed out). The Changes Pending mode is displayed just below the Apply button (Figure 10-22).
4.   The Changes Pending mode will remain in effect until a successful response from the MDT is received.
5.   If a successful response from the MDT is received, the Front Panel dialog will be reactivated (if the OK button is used, the Front Panel dialog will be closed).
6.   If the operation is not successful, an error message is displayed.
7.   On the Error dialog box, Click OK to return to the Front Panel tab.

Figure 10-22. Apply Changes to the MDT, Screens

<u>10.6.5.2.3 Refresh Radio Settings</u>.- This procedure restores the radio settings to the last settings applied. This is enabled only in the Editing Mode.

1.   In the Front Panel tab, while in the Editing Mode, click on the Refresh button.

2.   A dialogue box will appear stating that all changes will be lost and asking if you wish to continue (Figure 10-23). Click on Yes. (Clicking on No will abort the Refresh and return to Editing Mode).

3.   The Front Panel settings will be restored to the last settings applied. i.e. all settings entered during the current editing session will be lost.
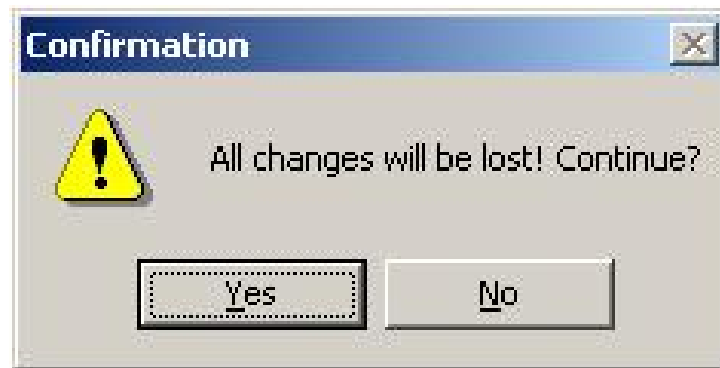
Figure 10-23. Refresh Radio Settings Confirmation, Screen

10.6.5.3 Front Panel Tab.- A sample CM-300 UR Detail window Front Panel tab is shown Figure 10-24. The Front Panel tab controls are described in Table 10-5. Detailed descriptions of operational procedures are provided in Section 10.6.5.4.

Figure 10-24. Front Panel Tab

Table 10-5. Front Panel Tab Controls

Name	Limits	Control	Execution	Description
Frequency (MHz)	225.000 to 399.975	Edit box	Selection of Apply	Receiver operating frequency. 225.000 to 399.975 MHz range (in 0.025 MHz increments). Values outside this range will not be accepted. Factory default is at 225.000 MHz.
Radio Type	"CM-300 UR", "CM-300 UT", or "CM-350 UT"	Static text control	N/A	Display radio type. The radio type is defined during Setup (see 10.6.2). It may be a CM-300 UR, or a CM-300 UT, or CM-350 UT.
Radio Address	0 to 15	Static text control	N/A	Display radio address. The radio address is defined during Setup (see 10.6.2). Factory default is at 15.
RF Tuning Mode	"Fixed" or "Remote"	Drop-down list box	Selection of Apply	Set radio to fixed tuning mode or remote tuning mode. Fixed tuning mode uses the cavity filter which is tuned locally. Remote tuning mode by-passes the cavity filter and the radio is tuned remotely. Factory default is at Remote.
Reference Frequency	0 to 255	Edit box with spin control	Selection of Apply	Reference Frequency (Crystal Warp). The reference frequency is generated by a 16.8 MHz Voltage Controlled Temperature Compensated Crystal Oscillator (VCTCXO). This VCTCXO provides the reference frequency to both Local Oscillators and to the REF MON connector on the receiver front panel. The reference frequency can be calibrated using the procedure outlined in Section 6.2.

Table 10-5. CM-300 UR Detail Window Controls (Contd)

Name	Limits	Control	Execution	Description
Summary Fault Status	N/A	List box	N/A	Display alarm/alert states when a monitored parameter is in transition. There are 2 columns in this list. First column contains the Alarm/Alert states. Second column contains the faults. Click on the column header to sort data in that column. For a radio, the following statuses are reported: **Normal -** Normal condition, receiver fully operational **Alert -** Some performance parameters degraded, receiver still operational **Alarm -** Performance severely degraded, receiver operational status questionable **Failure -** Receiver not operational, requires immediate attention For a receiver, the following faults are reported: ▪ +12 V ▪ Audio ▪ -12 V ▪ Squelch ▪ Elapsed Time ▪ Synth1 Frequency ▪ Synth2 Frequency ▪ LO Level ▪ Mute
Factory Reset	N/A	Button	Immediate	Reset radio to factory default settings: Frequency (MHz) 225.000 RF Tuning Mode "Remote" Carrier Squelch Unchecked (Off) Noise Squelch Unchecked (Off) Squelch Threshold 100 Audio Level 008 (~ -8 dBm) Mute Level "No Audio" Mute Radio "Off" Mute Icon Black (Off)
Carrier Squelch	Checked or Unchecked	Check box	Selection of Apply	Turn carrier squelch on or off. If the check box is checked, carrier squelch is on and vice versa. Factory default is at Unchecked (Off)

Table 10-5. CM-300 UR Detail Window Controls (Contd)

Name	Limits	Control	Execution	Description
				This feature allows audio signals to be routed to the REM INT connector, speaker, and headset only after a certain RF signal level threshold has been reached. This feature is enabled in the CM-300 UR Detail Window by checking the box next to Carrier Squelch and setting the Squelch Threshold value (see Section 10.6.5.4.6). A graph showing the approximate Squelch Threshold settings required versus the RF Signal Level is shown in Figure 9-9.
Noise Squelch	Checked or Unchecked	Check box	Selection of Apply	Turn noise squelch on or off. If the check box is checked, noise squelch is on and vice versa. Note that the carrier squelch must be selected for this to be available for change.
				Factory default is at Unchecked (Off).
				This feature allows audio signals to be routed to the REM INT connector, speaker, and headset after a certain audio signal-to-noise threshold has been reached. This feature is enabled in the CM-300 UR Detail Window by checking the boxes next to Carrier Squelch and Noise Squelch and then setting the Squelch Threshold value (see Section 10.6.5.4.6). A graph showing the approximate Squelch Threshold settings required versus the audio signal-to-noise level is shown in Figure 9-8.
Squelch Threshold	0 to 255	Edit box with spin control	Selection of Apply	Set the squelch threshold level.
				Factory default is at 100.
				This is a value from 20 to 255 that corresponds to the threshold at which the audio circuits are

Table 10-5. CM-300 UR Detail Window Controls (Contd)

Name	Limits	Control	Execution	Description
				enabled to allow audio signals to be routed to the REM INT connector, speaker, and headset. This setting is used for both the RF signal level (Carrier Squelch) threshold and the audio signal-to-noise threshold (Noise Squelch).
Audio Level	0 to 255	Edit box with spin control	Selection of Apply	Set the audio level digital pot. This basically provides audio volume control for the remote audio. Factory default is at 008 (~ -8 dBm)
Mute Level	"-15 dB", " -20 dB", "No Audio"	Drop-down list box	Selection of Apply	Set the mute level. This applies only to the remote audio. The Mute Radio should be On for this to be enabled.
Mute Radio	"On", "Off"	Button	Immediate	Mute and unmute radio. Text is toggled between "Mute Radio On" and "Mute Radio Off". If the text is "Mute Radio On," the Mute icon changes to green and when the text is "Mute Radio Off," the Mute icon changes to black. This applies only to the remote audio. Factory default is at Off
Mute Icon	N/A	Icon	N/A	When the radio is muted, this icon turns green () When the radio is not muted, this icon turns black () Factory default is at Black (Off)

10.6.5.4 Front Panel Tab Operation.- This section provides detailed descriptions for procedures that may be executed using the Front Panel tab. Some procedures, involving one or two steps and no more screens beyond the Front Panel tab screen, are considered self-explanatory. The functional description provided in Table 10-5 should be adequate.

The following procedures are provided:

- Set Frequency [MHz]
- Set the RF Tuning Mode
- Set Reference Oscillator Frequency
- Check Summary Fault Status and Current Status of Radio
- Reset to Factory Default Settings
- Set Squelch Threshold
- Set Audio Level
- Set Mute Level

NOTE

Error checking is applied when the **OK** or **Apply** button is clicked. There is minimal error checking when each input field is being edited. For example, input fields that require numerical values will not accept alpha characters. Input values are then validated against actual ranges/limits when they are about to be applied to the MDT.

When using the UHF MDT Software to make changes to the radio parameters, change one parameter at a time. Click on Apply (or OK) to apply the change before proceeding with further changes.

10.6.5.4.1 Set Frequency [MHz].- This procedure sets the radio's operating frequency. This input should be within the 225.000 to 399.975 MHz range (in 0.025 MHz increments). Values outside this range will not be accepted.

| NOTE |

The operating frequency may also be at the Radio Control window (see Section 10.6.4.1).

1.   In the Front Panel tab, select Frequency [MHz] and make desired changes (Figure 10-25).

2.   Click on Apply (or OK) to apply the changes to the MDT (see Section 10.6.5.2.2)

Figure 10-25. Set Frequency [MHz], Screen

10.6.5.4.2 Set the RF Tuning Mode.- This procedure selects either the Fixed Tuning Mode or the Remote Tuning Mode.

1. In the Front Panel tab, click on the pulldown menu of RF Tuning Mode.

2. Select the desired mode (Figure 10-26).

3. Click on Apply (or OK) to apply the changes to the MDT (see Section 10.6.5.2.2).

Figure 10-26. Set RF Tuning Mode, Screen

10.6.5.4.3 Set Reference Oscillator Frequency.- The Reference Oscillator Frequency is preset at the factory in order to fine-tune the reference oscillator to 16.8 MHz. If it should require adjustment, proceed as follows:

1. Refer to the procedure in Section 6.2 and perform the steps below in conjunction with the procedure in Section 6.2.

2. In the Front Panel tab, click on the up/down arrows of the Reference Frequency window to change the reference frequency (Figure 10-27). Increasing the value increases the reference frequency and decreasing the value decreases the reference frequency.

3. Click on Apply (or OK) to apply the changes to the MDT (see Section 10.6.5.2.2).

Figure 10-27. Set Reference Frequency, Screen

10.6.5.4.4 Check Summary Fault Status and Current Status of Radio.- The Summary Fault Status displays alarm/alert states when a monitored parameter is in transition. There are 2 columns in this list. First column contains the Alarm/Alert states. Second column contains the Faults. Click on the column header to sort data in that column.

Current status of radio is displayed in the Status window and reflects the most critical status reported in the Summary Fault Status list. This status is also displayed in the Radio Control window (Figure 10-28).
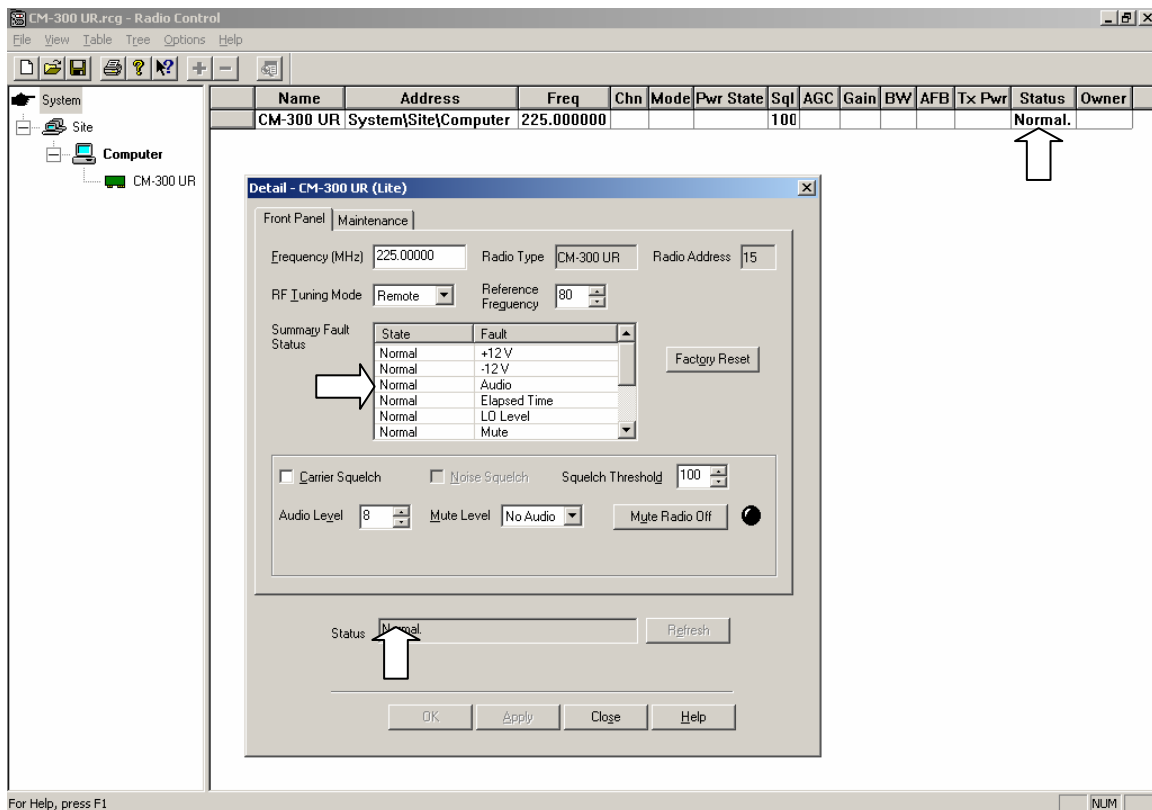
Figure 10-28. Check Summary Fault Status and Current Status of Radio, Screen

10.6.5.4.5 Reset to Factory Default Settings.- This procedure will restore factory default settings.

1.   In the Front Panel tab, click on the Factory Reset button.

2.   The Front Panel returns the radio to factory default (Figure 10-29).

Figure 10-29. Reset to Factory Default Settings, Screen

10.6.5.4.6 Set Squelch Threshold.- This procedure sets the Carrier and Noise squelch threshold.

For this procedure, the Carrier Squelch has to be on when setting the Carrier Squelch Threshold; both the Carrier Squelch and Noise Squelch have to be on when setting the Noise Squelch Threshold.

NOTE

The Squelch Threshold may also be set at the Radio Control window (see Section 10.6.4.2).

1. In the Front Panel tab, click on the Carrier Squelch (and Noise Squelch if you are setting the Noise Squelch Threshold) to turn it on (check-marked).
2. In the Front Panel tab, click on the up/down arrows of the Squelch Threshold window to select the desired level (Figure 10-30).
3. Click on Apply (or OK) to apply the changes to the MDT (see Section 10.6.5.2.2).

Figure 10-30. Set Squelch Threshold, Screen

10.6.5.4.7 Set Audio Level.- This procedure sets the volume level of the remote audio signal. The higher the setting, the higher the volume of the audio signal. The Factory Default setting is

008 (~ -8 dBm).

1. In the Front Panel tab, change the audio level by clicking on the up or down arrows, on the right side of the Audio Level, to the desired value (Figure 10-31).

2. Click on Apply (or OK) to apply the changes to the MDT (see Section 10.6.5.2.2).

<u>10.6.5.4.8 Set Mute Level</u>.- This procedure sets the mute level of the radio to one of three settings (-15dB, -20dB, or No Audio). This applies only to the remote audio.

The Mute Radio should be set to On for this procedure (factory default setting is at Off).

1. In the Front Panel tab, click Mute Radio to On. The Mute Radio icon turns green (Figure 10-31).

2. Click on the down arrow of the Mute Level window and select desired mute level.

3. Click on Apply (or OK) to apply the changes to the MDT (see Section 10.6.5.2.2).

$$\boxed{\text{WARNING}}$$

If Mute Radio is set to On from the MDT, it is imperative that it is returned to the Off setting before disconnecting the MDT. If not, radio two-way communications will be disabled which may result in very serious consequences.

When the MDT reestablishes a connection, it can not determine if the Mute Radio was asserted by the MDT in a previous session.

4. In the Front Panel tab, click Mute Radio to Off. The Mute Radio icon turns black (Figure 10-31).

Figure 10-31. Set Mute Level, Screen

10.6.5.5 Maintenance Tab.- The second tab on the Detail Window is the Maintenance tab. The
Maintenance tab is shown in Figure 10-32 and its controls are described in Table 10-6. This tab
is available for both receivers and transmitters.

Using the Maintenance tab, the user may

- Refresh the elapsed time (Section 10.6.5.6.1)

- Refresh the event log (Section 10.6.5.6.2)

- Download software to the radio (Section 10.6.5.6.3)

Figure 10-32. Maintenance Tab

Table 10-6. Maintenance Tab Controls

Name	Limits	Control	Execution	Description
Software Version	N/A	Static text control	N/A	Display the radio software version.
Serial Number	0 to 999999	Static text control	N/A	Display the radio's serial number.
Elapsed Time	N/A	Static text control	N/A	Radio's elapsed time after queried is displayed here. Elapsed time is displayed in hours format.
Time Refresh	N/A	Button	Immediate	Click to query the radio's elapsed time.
Total PTTs	N/A	Static text control	N/A	Radio's total number of PTTs after queried is displayed here. This control is grayed out if radio is a receiver.
PTT Refresh	N/A	Button	Immediate	Click to query the radio's total number of PTTs. This control is grayed out if radio is a receiver.
Log Refresh	N/A	Button	Immediate	Click to query the radio's event log. All events are updated each time button is clicked on.
Event Log	N/A	List box control	N/A	Radio's logs after queried are displayed here. Up to 100 entries are displayed.
Software Download	N/A	Button	Immediate	Click to download new radio software to the radio.

10.6.5.6 Maintenance Tab Operation .- This section describes procedures that may be executed using the Maintenance tab.

- Check Elapsed Time

- Check Event Log

- Download Software

10.6.5.6.1 Check Elapsed Time [hrs].- This procedure checks the accumulated hours the radio has been operating. To display elapsed time, first do time refresh (Figure 10-33).

1. In the Maintenance tab window, click on Time Refresh.

2. The Maintenance tab momentarily goes into the Changes Pending mode while it is retrieving the latest elapsed time record.

3. The elapsed time is displayed and the Maintenance tab returns to normal.

4. Read elapsed time in hours in the Elapsed Time [hrs] window.
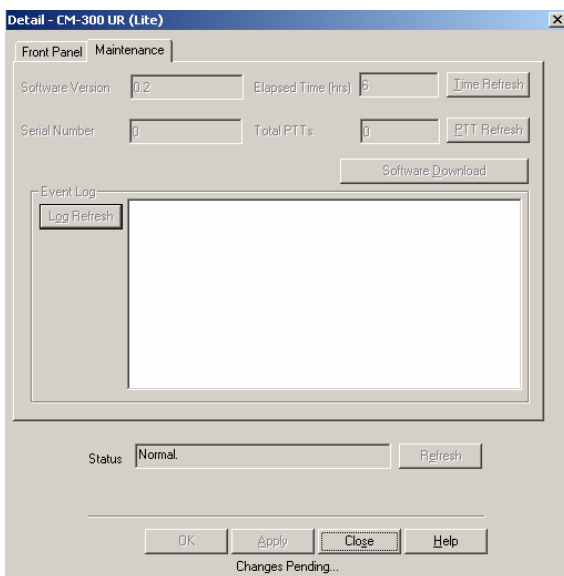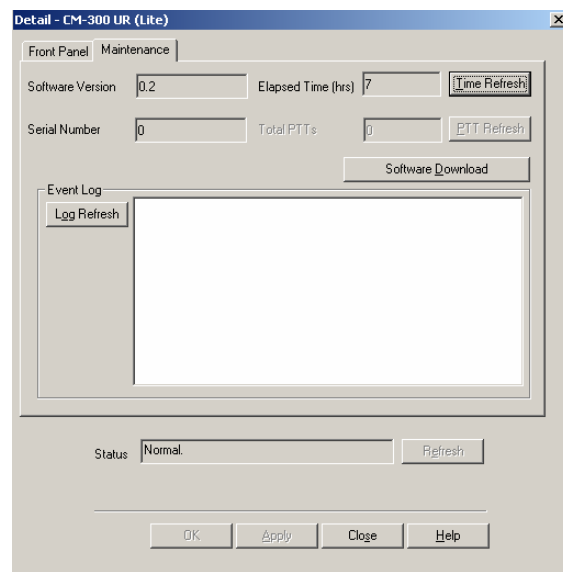
Changes Pending Mode   Elapsed Time Refresh

Figure 10-33. Check Elapsed Time, Screen

10.6.5.6.2 Check Event Log.- This procedure checks the event log of the radio. To display event log, first do Log Refresh.

1.   In the Maintenance tab window, click on Log Refresh.

2.   The Maintenance tab goes into the Changes Pending mode while it is retrieving the latest Event Log.

3.   The Event Log is displayed and the Maintenance tab returns to normal.

4.   Read Event Log in the event log window (see Figure 10-34 and Table 10-7).
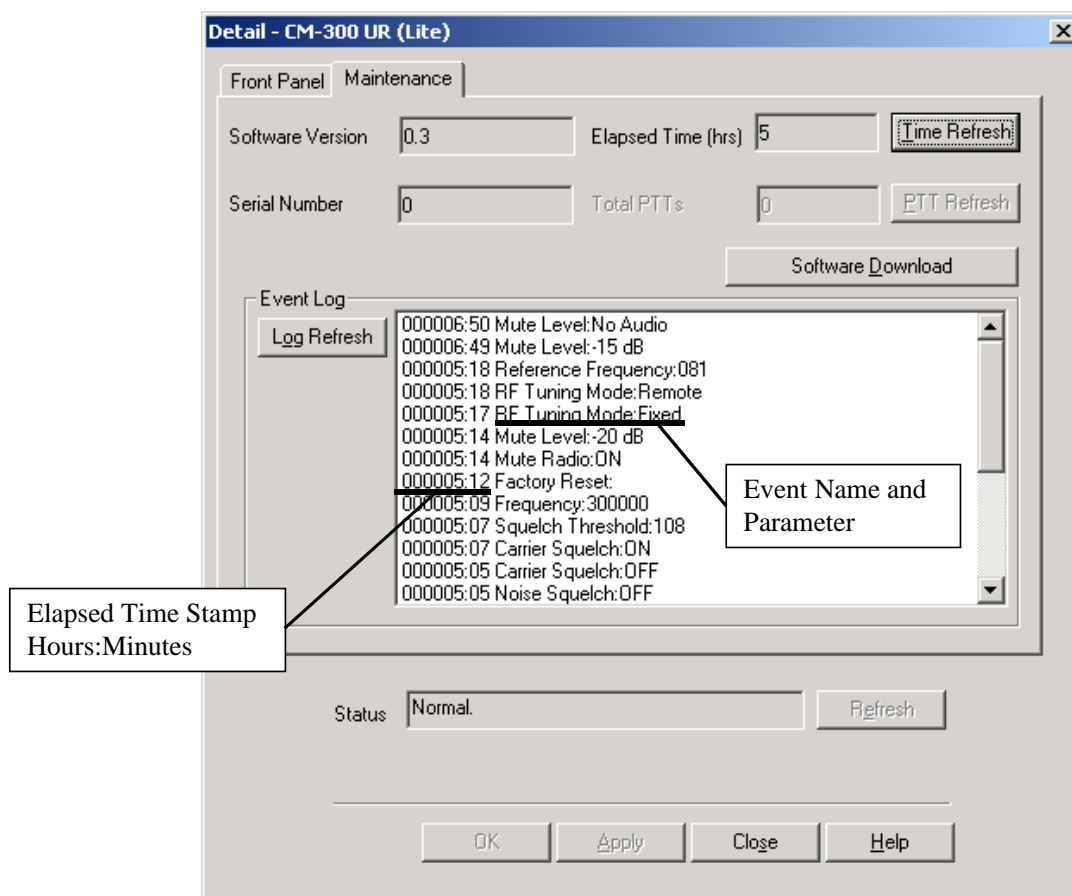
Figure 10-34. Check Event Log, Screen

$$\boxed{\textbf{NOTE}}$$

The Elapsed Time timer stores the hours in non-volatile memory, however it does not store the minutes. In the event of a processor reset (loss of power or cycling power), the timer minutes are reinitialized back to 00. It begins counting up from that point until 59 minutes and then increments the hour counter. As a result, it is possible for an event that occurs chronologically later to have an Elapsed Time Stamp earlier than an event that occurred chronologically earlier than the current event.

Table 10-7. Event Log Entries

Event Name	Description
ALARM +12 V	+12 Volts is outside of a factory set range.
NORMAL +12 V	+12 Volts has recovered from an ALARM condition.
ALARM -12 V	-12 Volts is outside of a factory set range.
NORMAL -12 V	-12 Volts has recovered from an ALARM condition.
FAILURE LO Level	LO Level is outside of a factory set range.
NORMAL LO Level	LO Level has recovered from an ALARM condition.
FAILURE Synth1 Freq	Synth1 failed to lock on frequency.
NORMAL Synth1 Freq	Synth1 has recovered from a FAILURE condition.
FAILURE Synth2 Freq	Synth2 failed to lock on frequency.
NORMAL Synth2 Freq	Synth2 has recovered from a FAILURE condition.
ALERT Audio	Audio level is outside of a factory set range.
NORMAL Audio	Audio level has recovered from an ALERT condition.
ALERT Squelch	Audio level is outside of a factory set range.
NORMAL Squelch	Audio level has recovered from an ALARM condition.
ALERT Elapsed Time	Elapsed time failed to update correctly.
NORMAL Elapsed Time	Elapsed time has recovered from an ALERT condition.
ALERT Mute	Audio level is outside of a factory set range while under mute conditions.
NORMAL Mute	Audio level has recovered from an ALERT condition while under mute conditions.

Table 10-7. Event Log Entries (Contd)

Event Name	Description
PWR UP: App x.x, Boot y.y	Radio has powered up with Application SW Version x.x, and Boot SW Version y.y.
Software Download	A Software Download event has occurred.
Squelch Threshold:xxx	Squelch Threshold value has changed to xxx.
Audio Level:xxx	Audio Level has changed to xxx.
Frequency:xxxxxx	Frequency has changed to xxxxxx kHz.
Factory Reset:	Factory Reset event has occurred.
Mute Level:xxxxxxxx	Mute Level has changed to xxxxxxxx, where xxxxxxxx is either "No Audio", "-15 dB", or "-20 dB".
Mute Radio:xxx	Radio's mute function has changed to xxx where xxx is either "ON or "OFF".
Noise Squelch:xxx	Noise Squelch function has changed to xxx where xxx is either "ON or "OFF".
Carrier Squelch:xxx	Carrier Squelch function has changed to xxx where xxx is either "ON or "OFF".
RF Tuning Mode:xxxxxx	RF Tuning Mode has changed to xxxxxx where xxxxxx is either "Remote" or "Fixed".
Reference Frequency:xxx	Reference Frequency warp value has changed to xxx.

10.6.5.6.3 Software Download.- This procedure will download new software to the radio. Refer to the Maintenance tab (Figure 10-31) and proceed as follows:

| NOTE |

This is only possible through the local (front panel) MDT connector

1. Connect MDT to the local (front panel) MDT connector.

2. Insert CD containing the radio software in the CD ROM drive.

3. In the Maintenance tab, click on the Software Download button. A confirmation dialog is displayed (Figure 10-35).
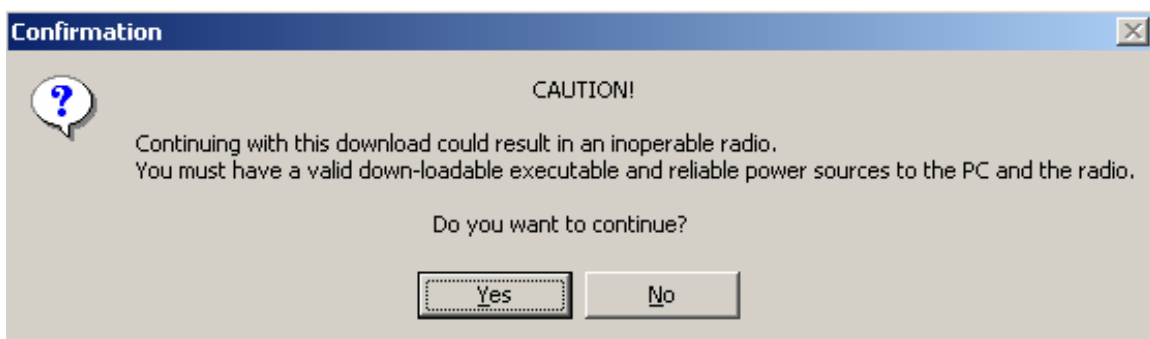
Figure 10-35. Software Download Confirmation, Dialog Box

4. Read the CAUTION note carefully. If you feel ready press Yes to continue; if not, press No to return to the Maintenance tab.

5. If the **Yes** button in the above dialog is clicked, the Open dialog menu (Figure 10-36) is displayed.
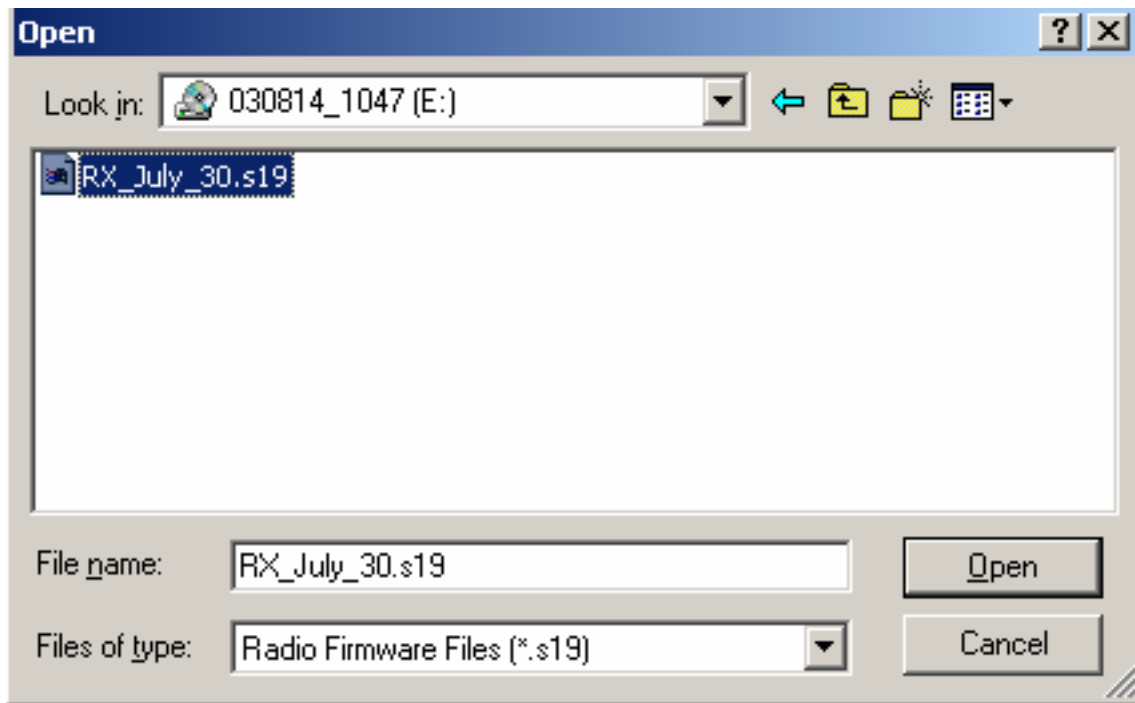
Figure 10-36. Software Download – File Open Dialog

6. In the Open dialog menu, look in the CD ROM folder and select the new software file **(.s19 type)** to be downloaded to radio.

7. Click on Open. The software download process is initiated and the Detail dialog will go into the Changes Pending mode (Figure 10-37).
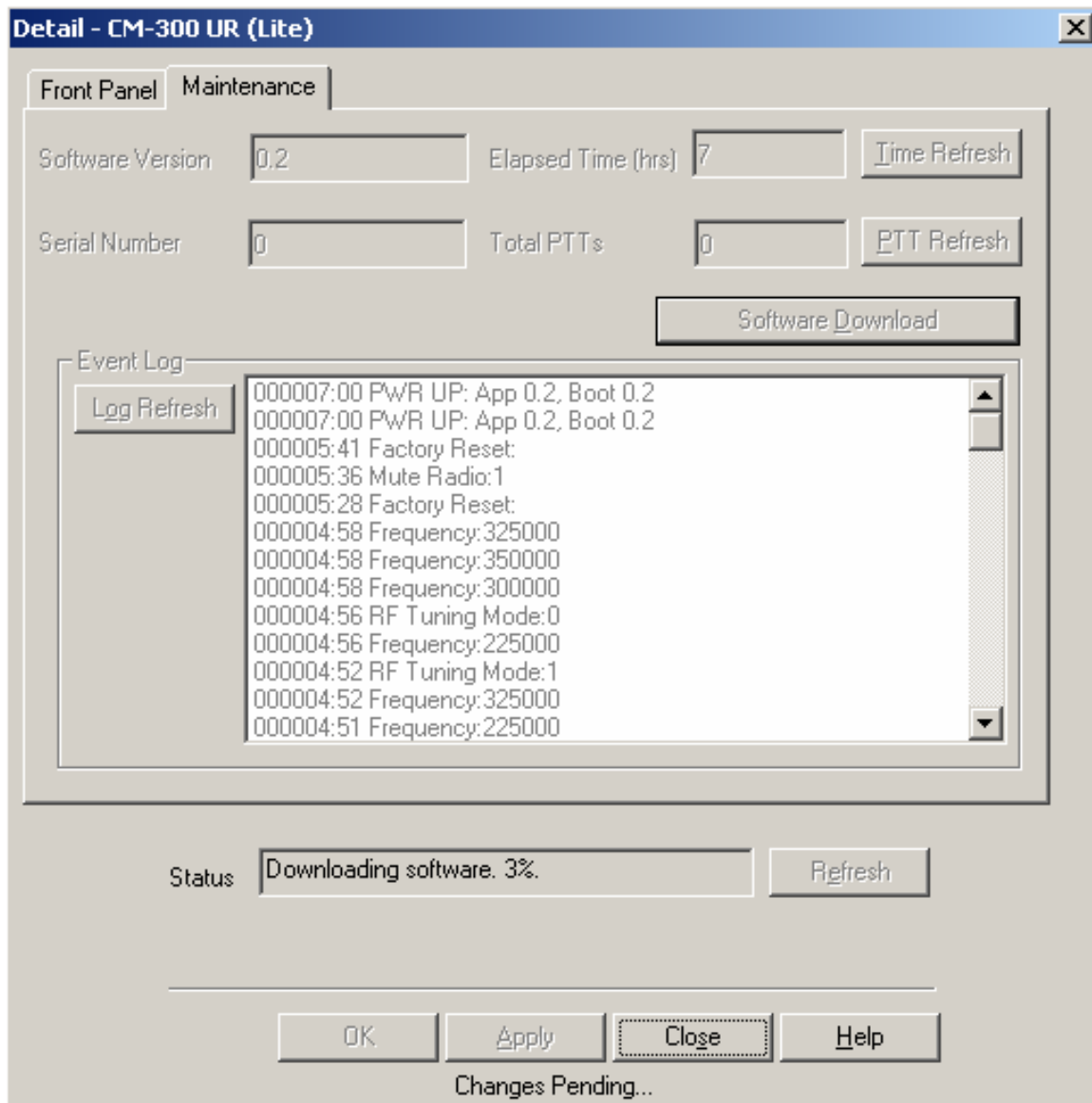
Figure 10-37. Software Download – Changes Pending Mode

8.   The Changes Pending mode will remain until the software has been successfully
     downloaded, in which case it will display a message to that effect (Figure 10-38).
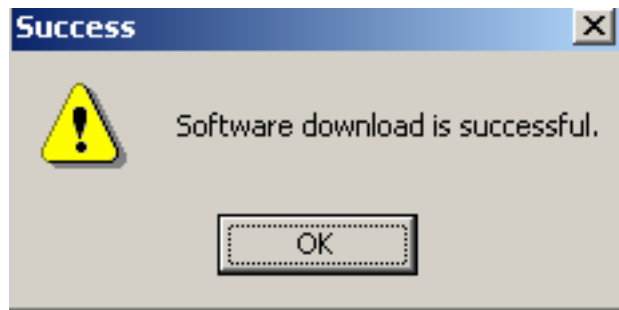
Figure 10-38. Software Download Successful Message

9. Click OK to return to the normal Maintenance tab.

10. If software download was unsuccessful, an error message will be displayed indicating the error encountered (Figure 10-39). Table 10-8 lists the messages that may be displayed in this dialog box.

NOTE

If software download was unsuccessful, it will revert back to the previous version of the software. In order to reinitialize this version, cycle power to the radio (switch power off and then on).
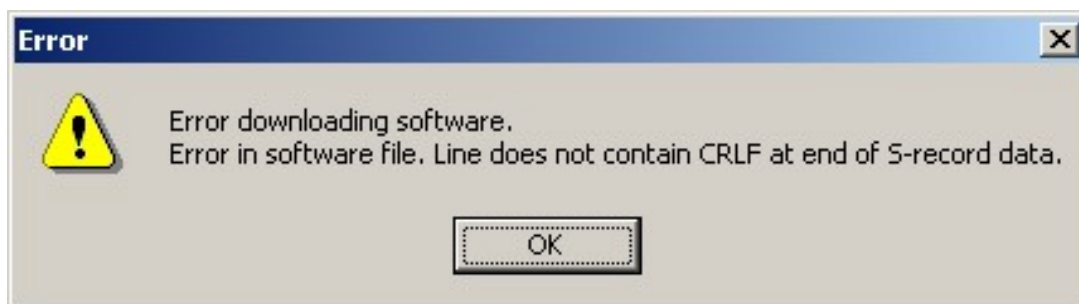
Figure 10-39. Software Download Unsuccessful Message

Table 10-8. Software Download Unsuccessful Messages

Message	Description	Corrective Action
"Error downloading software. Timeout waiting for radio to response. Software download is not successful."	Timeout waiting for a response from the radio.	Ensure the MDT interface cable is properly connected. Verify the CD-ROM is the correct CD-ROM, and that it is not damaged. Check that the minimum requirements for the system hardware are met.
"Error downloading software. Software file does not exist."	Software file does not exist.	Verify the CD-ROM is the correct CD-ROM, and that it is not damaged.
"Error downloading software. Software file is too large."	Software file is too large. File size is limited to 64k.	Check that the minimum requirements for the system hardware are met.
"Error downloading software. Not enough memory."	MDT software does not have enough memory to load the software file.	Check that the minimum requirements for the system hardware are met.
"Error downloading software. Error reading software file."	Error reading records from software file. File could be damaged.	Verify the CD-ROM is the correct CD-ROM, and that it is not damaged.
"Error downloading software. Error transferring software file."	Error transferring software file to a temporary location.	Check that the minimum requirements for the system hardware are met.
"Error downloading software. Error creating temporary file."	Error creating a temporary file from software file.	Check that the minimum requirements for the system hardware are met.
"Error downloading software. Software file has no records."	Software file has no valid records.	Verify the CD-ROM is the correct CD-ROM, and that it is not damaged.
"Error downloading software. Error in software file. Line does not start with 'S'."	Software file has records with invalid format. Line does not begin with 'S'.	Verify the CD-ROM is the correct CD-ROM, and that it is not damaged.

Table 10-8. Software Download Unsuccessful Messages (Contd)

Message	Description	Corrective Action
"Error downloading software. Error in software file. Line does not contain CRLF at end of S-record data."	Software file has records with invalid format. Line doesn't end with CRLF.	Verify the CD-ROM is the correct CD-ROM, and that it is not damaged.
"Error downloading software. Error in software file. Line does not contain a supported S-record."	Software file has records that the MDT software doesn't support.	Verify the CD-ROM is the correct CD-ROM, and that it is not damaged.
"Error downloading software. Error while downloading. Received a NAK response."	Receive a NAK from radio while downloading software.	Ensure the MDT interface cable is properly connected

10.6.6 SHUTTING DOWN THE UHF MDT SOFTWARE.- To shutdown the UHF MDT Software, perform the following steps:

1. Shutdown the UHF MDT Software by clicking the "X" button in the upper right corner of the CM-300 UR Control Window as shown in figure 10-40.

NOTE

Software shutdown is immediate. All changes made using the CM-300 UR Detail Window will be lost unless the apply button has been clicked.
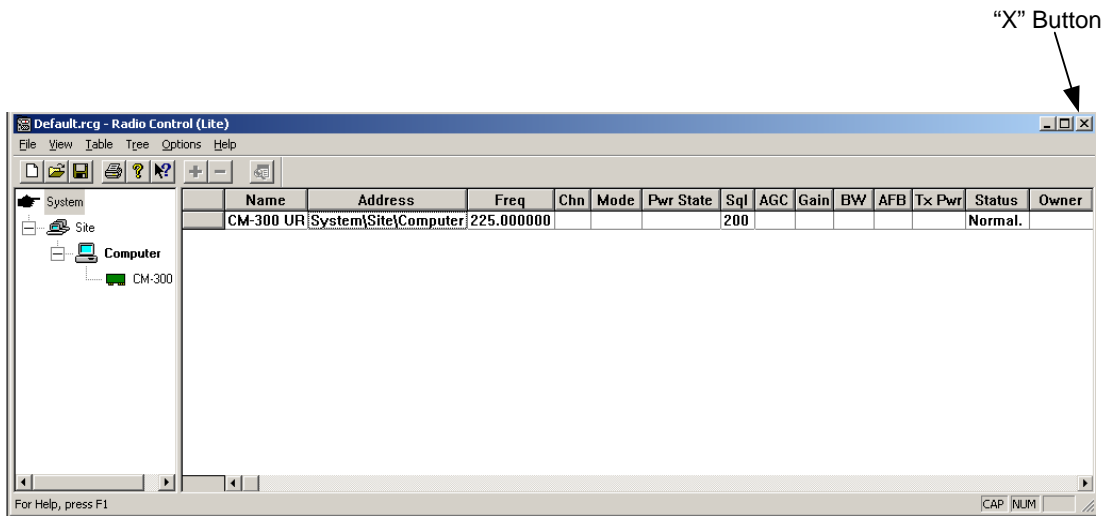
"X" Button

Figure 10-40. CM-300 UR Control Window for Shutdown

2.   After clicking the "X" button all the UHF MDT Software windows will close, and the
     UHF MDT Software shutdown procedure is complete.

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APPENDIX A
SECOND LEVEL ENGINEERING SUPPORT AND WARRANTY SERVICE PROCEDURE

A.1 SECOND LEVEL ENGINEERING SUPPORT CONTACT INFORMATION.- Second level engineering assistance to CM-300 equipment is provided by the OKC Communications Systems Engineering Support Branch, AOS-510. Contact the AOS-510 air-to-ground field support team using the following telephone numbers. This support is available 24 hours a day, seven days a week.

(405) 954-0066 – 0800 – 1600, Monday through Friday, Central Time

1.   (405) 954-3583 – all other days and times (on duty for Emergencies Only)

A.2 WARRANTY SERVICE PROCEDURE.- The CM-300 Line Replaceable Units (LRU) below are covered by warranty. The warranty expiration date is shown on a label attached to the unit.

Table A-1. CM-300 LRUs Under Warranty

Item Name	Manufacturer Part Number	National Stock Number (NSN)
Receiver, CM-300 UHF	01-P40100G001	5840-01-505-7137
UHF MDT S/W	99-P40681G	7025-01-505-7164

NOTE

Removing the radio cover will void the warranty resulting in delays in repair and additional expense. This equipment is not to be opened without prior authorization.

Warranty service procedures are as follows:

1.   Site With Failed LRU – Place order for LRU replacement through the Logistics and Inventory System (LIS).

    a.   Go to LIS online requisitioning, select requisition entry screen and input the National Stock Number (NSN), Supply Support Code and Priority.

    b.   At that time you may ENTER or tab down to the OPTIONS area and enter the option #3 (Failure Under Warranty).

    c.   Input the serial number of the failed unit.

NOTE

Without this information, processing your requisition will be delayed until this information is provided.

2.   FAA Logistics Storage Facility - Ship serviceable LRU along with:

   a.   FAA Form 4650-10, WARRANTY FAILURE REPORT.
   b.   Prepaid shipping Fed/Ex label, to be used by the site to return the failed LRU to General Dynamics for repair.

3.   Site with failed LRU –

   a.   Upon receipt of paperwork, complete the following blocks in FAA Form 4650-10 (see appropriate sample form, Figure A-1 or A-2):

   - DATE OF REPORT (today's date)
   - CONTROL NUMBER (reference OUTGOING VOUCHER NO. located on the SHIPPING ORDER, FAA FORM 4250-4).
   - #2 (Originator)
   - #3 (Phone)
   - #4 (Facility Address)
   - #18 (Serial Number)
   - #22 (Date Operative)
   - #23 (Date Failed)
   - #25 (Requisition No.)
   - #26 (Failure Narrative)

   b.   Return the repairable asset to General Dynamics using the preprinted FedEx label. Include a copy of the completed FAA Form 4650-10 form with the shipment and maintain a copy for your records.

CAUTION

   If possible, pack the equipment in the original shipping container using the original packing material. Otherwise, pack the equipment in accordance with best commercial practices to ensure safe return to General Dynamics.

4.   General Dynamics –

   a.   If all information is in order, Repair failed LRU and return serviceable unit to the FAA Logistics Storage Facility.
   b.   If returned LRU is found to be out of warranty, contact the FAA Logistics Storage Facility.

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION **WARRANTY FAILURE REPORT**	*DATE OF REPORT* REQUIRED	**CONTROL NUMBER** (DEPOT USE) REQUIRED

PART I – FACILITY DATA		PART II – EQUIPMENT DATA	

PART I – FACILITY DATA			**PART II – EQUIPMENT DATA**	
1. Facility Report No.			6. Name (*System/Facility*)	7. FA Type No.
2. Originator REQUIRED	3. Phone FTS: Comm: REQUIRED		8. Manufacturer	9. Serial No.
			10. Date Received	11. Date Operative
4. Facility Address REQUIRED			12. Date Failed	13. Date Warranty Exp.
			14. Contract/Order No. (*Equipment*)	
5. Contract No./Order No. (*Applicable to failed items*) DTFA01-03-C-00035				

PART III – FAILED COMPONENT DATA (*Above Equipment Only*)

ITEM NO	15. Part No. 01-P40100G001	16. Noun RECEIVER, CM-300 UHF	17. Manufacturer GENERAL DYNAMICS
	18. Serial No. REQUIRED	19. Ref. Designation	20. National Stock No. 5840-01-505-7137
	21. Qty. 1	22. Date Operative	23. Date Failed REQUIRED	24. Date Warranty Exp.
	25. Replace. Rqn. From Depot? RQN. NO.: REQUIRED DATE: PRIORITY: . . . . IF NOT REASON WHY:		26. Failure Narrative - Hours Operation REQUIRED

ITEM NO	15. Part No.	16. Noun	17. Manufacturer
	18. Serial No.	19. Ref. Designation	20. National Stock No.
	21. Qty.	22. Date Operative	23. Date Failed	24. Date Warranty Exp.
	25. Replace. Rqn. From Depot? RQN. NO.: DATE: PRIORITY: . . . . IF NOT REASON WHY:		26. Failure Narrative - Hours Operation

27. Additional Comments

FAA Form 4650-10 (11-75) SUPERSEDES PREVIOUS EDITION (computer generated form)

Figure A-1. FAA Form 4650-10 for CM-300 UR, UHF Receiver

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION **WARRANTY FAILURE REPORT**	DATE OF REPORT REQUIRED	CONTROL NUMBER (DEPOT USE) REQUIRED

PART I – FACILITY DATA

1. Facility Report No.

2. Originator REQUIRED	3. Phone FTS: Comm: REQUIRED

4. Facility Address
REQUIRED

5. Contract No./Order No. *(Applicable to failed items)*
DTFA01-03-C-00035

PART II – EQUIPMENT DATA

6. Name *(System/Facility)*	7. FA Type No.
8. Manufacturer	9. Serial No.
10. Date Received	11. Date Operative
12. Date Failed	13. Date Warranty Exp.

14. Contract/Order No. *(Equipment)*

PART III – FAILED COMPONENT DATA *(Above Equipment Only)*

ITEM NO

15. Part No. 99-P40681G	16. Noun UHF MDT S/W (Software)	17. Manufacturer GENERAL DYNAMICS
18. Serial No. REQUIRED	19. Ref. Designation	20. National Stock No. 7025-01-505-7164
21. Qty. 1	22. Date Operative	23. Date Failed REQUIRED	24. Date Warranty Exp.

25. Replace. Rqn. From Depot?
RQN. NO.: REQUIRED
DATE:
PRIORITY:
. . . .
IF NOT REASON WHY:

26. Failure Narrative - Hours Operation
REQUIRED

ITEM NO

15. Part No.	16. Noun	17. Manufacturer
18. Serial No.	19. Ref. Designation	20. National Stock No.
21. Qty.	22. Date Operative	23. Date Failed	24. Date Warranty Exp.

25. Replace. Rqn. From Depot?
RQN. NO.:
DATE:
PRIORITY:
. . . .
IF NOT REASON WHY:

26. Failure Narrative - Hours Operation

27. Additional Comments

FAA Form 4650-10 (11-75) SUPERSEDES PREVIOUS EDITION (computer generated form)

Figure A-2. FAA Form 4650-10 for UHF MDT Software

APPENDIX B
GLOSSARY OF TERMS, ACRONYMS AND ABBREVIATIONS

B.1 GLOSSARY OF TERMS:- A list of glossary of terms and their descriptions are listed below.

GLOSSARY	DESCRIPTION
Amplitude Modulation	In Amplitude Modulation, the carrier frequency is modulated by the amplitude of the audio signal.
Carrier Squelch	This feature allows audio signals to be routed to the REM INT connector, speaker, and headset only after a certain RF signal level threshold has been reached. This feature is enabled in the CM-300 UR Detail Window by checking the box next to Carrier Squelch and setting the Squelch Threshold value (see Section 10.6.5.4.6). A graph showing the approximate Squelch Break Threshold settings required versus the Squelch Threshold Setting is shown in Figure 9-9.
Elapsed Time	The accumulated hours that the radio has been operating.
Factory Reset	The Factory Reset operation resets the receiver back to its factory default settings.
Fixed Tuning Mode	In the Fixed Tuning Mode, the RF input signal is routed through an internal (or external) cavity filter for manual tuning.
Noise Squelch	This feature allows audio signals to be routed to the REM INT connector, speaker, and headset after a certain audio signal-to-noise threshold has been reached. This feature is enabled in the CM-300 UR Detail Window by checking the boxes next to Carrier Squelch and Noise Squelch. Then set the Squelch Threshold value (see Section 10.6.5.4.6). A graph showing the approximate Squelch Threshold settings required versus the audio signal-to-noise level is shown in Figure 9-8.
Radio Address	Radio address is configured by the binary state of pins 1, 2, 9, and 10 of the REM INT connector. This address must be included in the configuration of each radio.
Reference Frequency	The reference frequency is generated by a 16.8 MHz Voltage Controlled Temperature Compensated Crystal Oscillator (VCTCXO). This VCTCXO provides the reference frequency to both Local Oscillators and to the REF MON connector on the receiver front panel. The reference frequency can be calibrated using the procedure outlined in Section 6.2.

GLOSSARY	**DESCRIPTION**
Remote Tuning Mode	In RemoteTuning Mode, an internal (or external) cavity filter is not used. The RF input signal is routed through internal Voltage Tuned Filters (VTF) which may be remotely tuned through the MDT.
Squelch Threshold	This is a value from 20 to 255 that corresponds to the threshold at which the audio circuits are enabled to allow audio signals to be routed to the REM INT connector, speaker, and headset. This setting is used for both the RF signal level (Carrier Squelch) threshold and the audio signal-to-noise threshold (Noise Squelch).

B.2 ACRONYMS AND ABBREVIATIONS:- A list of acronyms and abbreviations and their descriptions are listed below.

ACRONYM/ ABBREVIATION	TERM
A/D	Analog to Digital
AC	Alternating Current
AFB	Alternate Frequency Band
AGC	Automatic Gain Control
ALC	Automatic Level Control
AM	Amplitude Modulation
ATC	Air Traffic Control
ATR	Antenna Transfer Relay
BP	Bandpass
BW	Bandwidth
CBI	Computer Based Instruction
CD	Compact Disc
COM Port	Communication Port
D/A	Digital to Analog
dB	Decibels
dBC	Decibels (referenced to carrier level)
dBm	Decibels (referenced to 1 milliwatt)
DC	Direct Current
DIP	Dual In-line Package
DIV	Division
DVM	Digital Voltmeter
FAA	Federal Aviation Administration
Freq	Frequency
GND	Ground

ACRONYM/ ABBREVIATION	TERM
GUI	Graphic User Interface
IC	Integrated Circuit
IF, I.F.	Intermediate Frequency
kHz	Kilohertz
LED	Light Emitting Diode
LIS	Logistics and Inventory System
LNA	Low Noise Amplifier
LO, L.O.	Local Oscillator
LPF	Low Pass Filter
LRU	Lowest Replaceable Unit/Line Replaceable Unit
MDT	Maintenance Data Terminal
MHz	Megahertz
MM	Millimeter/Multi Media
ms	Milliseconds
MSL	Mean Sea Level
mV	Millivolts
mVp-p	Millivolts/voltage Peak-to-peak
mW	Milliwatts
NC	Normally Closed/Not Completed
N/C	No Connection
NO	Normally Open
NSN	National Stock Number
OJT	On Job Training
PA	Power Amplifier
PLL	Phase-Locked-Loop
PPM	Parts Per Million

ACRONYM/ ABBREVIATION	TERM
PTT	Push To Talk
PWB	Printed Wiring Board
PWR	Power
REF MON	Reference Monitor
RF	Radio Frequency
RMM	Remote Maintenance Monitor
ROM	Read Only Memory
μs	Microseconds
S/N	Signal-to-Noise
STD	Standard
SW	Software
TIB	Technical Instruction Book
UHF	Ultra High Frequency
UR/UT	UHF Receiver/UHF Transmitter
μV	Microvolts
VAC, Vac	Alternating Current Volts/Voltage
VCA	Voltage Controlled Attenuator
VCO	Voltage Controlled Oscillator
VCTCXO	Voltage Controlled Temperature Compensated Crystal Oscillator
VDC, Vdc	Direct Current Volts/Voltage
Vp-p	Volts/Voltage Peak-to-peak
Vrms	Voltage Root Mean Squared
VSWR	Voltage Standing Wave Radio
VTF	Voltage Tuned Filter
W	Watts

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APPENDIX C
dBm CONVERSION TABLES

C.1 dBm TO WATTS CONVERSION.-

Table C-1. dBm to Watts Conversion

dBm	Watts	dBm	Watts
30.0	1.0	39.0	7.9
30.5	1.1	39.5	8.9
31.0	1.3	40.0	10.0
31.5	1.4	40.5	11.2
32.0	1.6	41.0	12.6
32.5	1.8	41.5	14.1
33.0	2.0	42.0	15.8
33.5	2.2	42.5	17.8
34.0	2.5	43.0	20.0
34.5	2.8	43.5	22.4
35.0	3.2	44.0	25.1
35.5	3.5	44.5	28.2
36.0	4.0	45.0	31.6
36.5	4.5	45.5	35.5
37.0	5.0	46.0	39.8
37.5	5.6	46.5	44.7
38.0	6.3	47.0	50.1
38.5	7.1	47.5	56.2

C.2 dBm TO µV CONVERSION.-

Table C-2. dBm to µV Conversion

dBm	µV	dBm	µV
-110.0	.707	-100.0	2.24
-109.5	.749	-99.5	2.37
-109.0	.793	-99.0	2.51
-108.5	.840	-98.5	2.66
-108.0	.890	-98.0	2.82
-107.5	.943	-97.5	2.98
-107.0	1.00	-97.0	3.16
-106.5	1.06	-96.5	3.35
-106.0	1.12	-96.0	3.54
-105.5	1.19	-95.5	3.75
-105.0	1.26	-95.0	3.98
-104.5	1.33	-94.5	4.21
-104.0	1.41	-94.0	4.46
-103.5	1.49	-93.5	4.73
-103.0	1.58	-93.0	5.01
-102.5	1.68	-92.5	5.30
-102.0	1.78	-92.0	5.62
-101.5	1.88	-91.5	5.95
-101.0	1.99	-91.0	6.30
-100.5	2.11	-90.5	6.68